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COMMERCIAL FISHERIES REVIEW

A REVIEW OF DEVELOPMENTS AND NEWS OF THE FISHERY INDUSTRIES PREPARED IN THE BRANCH OF COMMERCIAL FISHERIES

A. W. Anderson, Editor
R. T. Whiteleather, Associate Editor
J. Pileggi, Assistant Editor

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FREEZING FISH AT SEA--NEW ENGLAND

Part 1 - Preliminary Experiments[1/]

By Jean C. Hartshorne* and Joseph F. Puncochar**

ABSTRACT

FILLETS FROM ROUND-FROZEN THAWED FISH ARE COMPARED WITH FILLETS FROM ICED FISH AS TO PERCENT DRIP, SALT CONTENT, TRIMETHYLAMINE CONTENT, KEEPING QUALITY, AND YIELD.

INTRODUCTION

Freezing fish at sea as a means of preserving freshness throughout extended trawler voyages necessitated by the apparent scarcity of certain species of fish and the consequent greater effort and time required to bring in a payload has aroused considerable interest in the fishery industries of New England. In view of this interest, experimental freezing studies were initiated by the U. S. Fish and Wildlife Service during the latter months of 1948 aboard the Albatross III in conjunction with survey studies of the major fishing grounds off the New England coast. (The Albatross III was a research vessel of the Service's North Atlantic fishery biological investigations). The development of more successful methods of fish preservation aboard vessels other than icing is of extreme importance in view of the wide variance in quality of fish brought into port and the subsequent losses resulting from the less desirable fish. Freezing fish at sea is not entirely a new procedure and is practiced in some areas with success, particularly on West Coast species such as tuna.

Preserving fish aboard vessels by freezing for later defrosting, processing, and refreezing ashore is contrary to the rather widespread popular belief that once fish is frozen it should never be refrozen. It is believed that the ability of fish flesh to withstand the process of freezing, thawing, and subsequent refreezing is in large measure governed by the condition or freshness of the fish at the time of the initial freezing.

Pottinger et al (1949) in determining the effect of refreezing on quality of sea trout (Cynoscion regalis) fillets concluded that immediate freezing, with subsequent thawing, filleting, and refreezing of the fillets causes no marked adverse effect on quality over fillets prepared from freshly-caught iced fish.

* TECHNOLOGIST
** CHIEF, NORTH ATLANTIC TECHNOLOGICAL RESEARCH { FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, BOSTON, MASS.

1/ ORIGINAL PAPER PRESENTED AT THE ELEVENTH ANNUAL MEETING OF THE INSTITUTE OF FOOD TECHNOLOGISTS, NEW YORK, N. Y., JUNE 19, 1951, UNDER THE TITLE "STUDIES ON ROUND FISH FROZEN AT SEA, NEW ENGLAND SPECIES." ALSO APPEARED IN FOOD TECHNOLOGY, VOL. 5, NO. 12 (DECEMBER 1951), PP. 492-5.

EXPERIMENTAL PROCEDURES

The fish used in the studies reported herein were taken in the census trawls of the Albatross III. They included haddock (Melanogrammus aeglefinus), pollock (Pollachius virens), ocean perch (Sebastodes marinus), cod (Gadus morrhua) and hake (Urophycis tenuis). Quantities of fish caught in the census trawls were much smaller than usual commercial catches, consequently each lot of fish studied weighed only 100 to 150 pounds. All samples of fish were prepared for freezing or icing within two hours after being brought on deck.

Samples of fish for freezing were "in the round" (not eviscerated). The fish were washed in circulating sea water prior to freezing. Freezing was accomplished in a multi-coil still-air room capable of maintaining -20° F. (-29° C.) with the temperature rising to no higher than -10° F. (-23° C.) with a full load. The fish were laid flat on galvanized iron pans spread nine inches apart in the lower two-thirds of the freezer room for as effective use as possible of thermal currents. The fish were allowed to freeze solid and were not removed from the pans until after eight hours in the freezer.

After freezing, the fish were stored in boxes at 0° F. (-18° C.) for the remainder of the voyage. Since the trips were of relatively short duration (5 to 10 days), glazing of the fish previous to storage was not considered necessary. For comparison, similar species of fish of the same size and lot were stored in ice. These fish were eviscerated and washed previous to storage in ice. Since relatively small quantities of fish were caught, those fish stored in ice were not subjected to as much pressure in the pens as fish handled under commercial conditions.

Upon arrival at port, fish frozen in the round were thawed in circulating chlorinated (5 p.p.m. residual chlorine) sea water at 50° to 55° F. (10° to 13° C.) for approximately three hours. Thereafter, the round fish and iced fish were handled in accordance with existing commercial practice for filleting and brining.[2/]

The fillets were wrapped individually in cellophane, placed in five-pound waxed cartons and frozen in a multiplate freezer at -30° F. (-34° C.). After freezing, the packaged fillets were placed in master cartons for storage at 0° F. Samples were withdrawn for examination at monthly intervals.

A series of physical, chemical, and organoleptic tests were used to detect differences that might exist between fillets prepared from frozen-round-thawed and iced fish.

DISCUSSION OF PROCEDURES AND RESULTS

Yield of Fillets: During the course of filleting operations, records were kept of the percentage yield of fillets from the frozen-round-thawed fish and iced fish. The thawed round fish were not gutted prior to filleting. In order to place fillet yields on a comparable basis, 15 percent of the total round weight was allowed as the weight of the viscera. This figure is generally used throughout the industry as the average allowance for viscera of the various New England species. Actual weight of viscera from several hundred pounds of fish of different species, in later work, ranged from 11 to 22 percent. The liver portion of the viscera ranged from 1.3 to 3.1 percent of the round-fish weight or 12 to 32 percent of the viscera weight.

2/ GRATEFUL ACKNOWLEDGMENT IS MADE TO THE GENERAL SEAFOODS CORPORATION, BOSTON, MASSACHUSETTS, FOR COOPERATION IN THIS PART OF THE STUDY.

Inasmuch as the experimentally iced-dressed fish, used in this study, were not subjected to the same rigorous conditions of handling as commercially-iced fish, fillet yield data for commercially-iced fish were secured from seven processing plants in New England for further comparison. The yield data on commercially-iced fish are considered authentic since they were furnished by reliable firms normally processing an aggregate total of several million pounds of fillets annually. Fillet-yield data for frozen-round-thawed, experimentally-iced dressed, and commercially-iced dressed fish are shown in table 1.

Table 1 - Yield of Fillets from Round-Frozen-Thawed, Experimentally-Iced, and Commercially-Iced Fish

Species and Market Class	Type of Fillet	Fillet Yield		
		Round-Frozen-Thawed[1]	Experimentally Iced	Commercially Iced[2]
		Percent	Percent	Percent
Pollock, large	skin on	48.1	-	40-44
Pollock	skin on	47.5	47.1	32-42
Pollock, market	skin on, nape on	55.1	53.6	48-51
Ocean perch (rosefish)	skin on	28.3[3]	-	25-28
Cod, whale	skinless	48.5	44.4	35-40
Hake, market	skinless	50.7	48.1	42-43.5

1/CONVERTED TO ICED-FISH BASIS ALLOWING 15 PERCENT FOR VISCERA.
2/RANGE OF FILLET YIELDS FROM SEVEN NEW ENGLAND PLANTS.
3/ALLOWANCE FOR VISCERA NOT MADE SINCE OCEAN PERCH ARE NOT EVISCERATED COMMERCIALLY.

It was observed that fish frozen in the round appeared to retain the physical characteristics of fish in rigor mortis after thawing; also, the experimentally-iced fish appeared somewhat firmer than most commercially-iced fish. It is well known in the industry that the yield of fillets from firm fish (freshly caught) is greater than that from fish iced for seven or eight days.

Trimethylamine (TMA) Content of Round-Frozen-Thawed and Experimentally-Iced Fish: The trimethylamine (TMA) content of fillets from round-frozen-thawed and iced-dressed fish was determined at monthly intervals over a period of seven months of commercial cold storage (0° F.). The method outlined by Dyer (1945) was used. It is recognized that the trimethylamine test is primarily used to estimate the freshness of fish prior to processing into frozen fishery products or for sale as fresh-chilled fishery products. Since the frozen fish fillets prepared in this study were stored in commercial cold storage, it was believed desirable to test for this component throughout the entire cold-storage period as a check on the possibility of the fillets defrosting during storage.

The TMA content of packaged fillets, prepared from various species of round-frozen-thawed, experimentally iced-dressed, and commercially iced-dressed fish after commercial cold storage for periods up to seven months is shown in table 2.

The TMA values of round-frozen-thawed fillets of all species of fish studied were lower than those of fillets prepared from experimentally-iced or commercially-iced fish. In the case of haddock, all values were low and the differences not too significant. Low values for the experimentally-iced haddock may possibly be accounted for by the difference in age of the fish (6 days) over iced fish of the other species (10 days).

TMA values of fillets prepared from experimentally-iced fish were from two to five times greater than the values of fillets from round-frozen-thawed fish, depend-

ing on species. The "fishy" odor was particularly noticeable in the fillets of hake, pollock, and ocean perch prepared from iced fish. Fillets from round-frozen-thawed fish retained their fresh fish odor throughout the storage period. Fillets prepared from round-frozen-thawed hake had TMA values somewhat higher than others; however, the odor was that of good fresh fish.

Table 2 - Trimethylamine (TMA) Content of Frozen Fillets Prepared from Various Species of Round-Frozen-Thawed, Experimentally-Iced, and Commercially-Iced Fish

Species	Treatment Prior to Filleting	Trimethylamine in mg. per 100 g. of Fillet: Months in Commercial Cold Storage (0° F.) 1	2	3	4	5	6	7	Mean TMA Value for 7 Months Storage Period
Haddock	Round-frozen-thawed	0.5	0.5	0.5	0.3	0.4	0.2	0.2	0.4
	Bled, round-frozen-thawed	0.5	0.5	0.5	0.3	0.4	0.2	0.3	0.4
	Experimentally iced for 6 days	0.8	0.9	0.9	0.4	0.8	0.4	0.6	0.7
Cod	Round-frozen-thawed	0.5	0.4	0.8	1.4	1.4	1.3	0.8	0.9
	Experimentally iced for 10 days	5.9	4.3	2.2	4.4	4.6	4.9	4.9	4.5
Pollock	Round-frozen-thawed	1.1	2.8	1.3	1.3	1.1	1.1	-	1.5
	Experimentally iced for 10 days	11.7	5.9	7.0	9.6	5.6	6.6	-	7.7
Hake	Round-frozen-thawed	2.6	6.6	4.3	2.4	2.2	2.8	3.0	3.4
	Experimentally iced for 10 days	10.0	8.7	17.2	8.8	11.2	6.9	5.6	9.8
Ocean Perch (rosefish)	Round-frozen-thawed	0.3	0.3	0.2	0.0	0.1	-	-	0.2
	Commercially iced for 10 days	6.8	7.0	6.9	3.5	2.2	-	-	5.3

Free Drip: Drip measurements were made at monthly intervals on thawed samples of frozen fillets from round-frozen-thawed, experimentally-iced, and commercially-iced fish of the various species under test. Fillets were thawed for a period of three hours at room temperature on a $\frac{1}{2}$-inch mesh wire screen enclosed in an air-tight rectangular metal container. A tightly covered container was used in order to reduce drying by the warm room air. Differences in weight between the frozen and thawed samples were noted and calculated as the free-moisture loss or drip.

As will be seen from table 3, there is a tendency for the drip of fillets prepared from experimentally-iced and commercially-iced fish to be slightly higher over a 7-month storage period than the drip of fillets prepared from fish frozen in the round. In later experiments it is planned to determine the amount of expressible or press drip present in addition to the free drip for further information on this point.

It was noted after 5 to 6 months of cold storage that some of the fillet samples showed signs of desiccation. This may account in part for the variance in drip values for some of the fillets under study.

Organoleptic Tests: Throughout the storage period fillets prepared from the various species of fish under study were judged at monthly intervals for differences in appearance and taste by a qualified taste panel composed of members from the laboratory and selected experts from the industry. The appearance of the thawed and cooked fillets was considered in terms of color, firmness, and "wetness," and taste was evaluated by the flavor and texture characteristics of the samples.

In all instances throughout the period of the test, the raw fillets from round-frozen-thawed fish were judged to be more acceptable from the standpoint of being

Table 3 - Free Drip of Frozen Fillets Prepared from Round-Frozen-Thawed, Experimentally-Iced, and Commercially-Iced Fish

Species	Treatment on Vessel	Percent Drip: Months in Commercial Storage at 0° F. 1	2	3	4	5	6	7	Mean Value for 7 Months Storage Period
Haddock	Round-frozen	0.2	1.1	0.8	1.8	2.2	1.6	1.1	1.3
	Bled, round-frozen	0.2	1.1	0.9	0.6	1.3	1.0	1.1	0.9
	Experimentally gutted, iced for 6 days	0.6	1.2	1.3	1.4	1.8	1.7	1.3	1.3
Ocean Perch (rosefish)	Round-frozen	0.3	0.7	0.6	1.8	1.8	-	-	1.0
	Commercially iced for 10 days	0.9	1.3	1.1	2.0	3.7	-	-	1.8
Cod	Round-frozen	0.4	0.6	1.2	2.4	2.1	1.0	2.0	1.4
	Experimentally gutted, iced for 10 days	1.1	1.1	1.5	1.5	2.3	1.9	3.1	1.8
Hake	Round-frozen	1.3	0.9	3.5	1.7	1.1	0.8	1.6	1.5
	Experimentally gutted, headed, and iced for 10 days	2.1	1.8	3.4	2.2	1.8	1.4	4.0	2.4
Pollock	Round-frozen	0.6	1.2	1.8	2.7	1.1	1.9	-	1.5
	Experimentally gutted, gilled, and iced for 10 days	1.0	1.1	1.4	1.6	1.5	2.1	-	1.5

fresh; also, the cooked fillets had a "sea-salt" flavor without the undesirable fishy aftertaste associated with fillets from iced fish.

The firm texture of the raw fillets from fish frozen at sea in contrast to the sometimes mushy texture of fillets prepared from iced fish was also considered a significant difference. The color of the fillets from fish frozen in the round remained "bright and life-like" whereas fillets prepared from experimentally and commercially iced fish were dull and bleached out. Additional work on differences in color, taste, and texture under carefully controlled conditions is planned in order to further develop the findings of this preliminary study.

Bleeding Fish Prior to Freezing: Blood in the round fish frozen at sea had been considered as a possible factor in discoloring fillets after thawing. Accordingly, a sample lot of scrod haddock was bled prior to freezing. Fillets prepared from this sample appeared no different than the fillets prepared from unbled haddock frozen in the round. Although this observation indicates that blood may not be a factor of importance in the coloration of fish fillets prepared from unbled round frozen fish, additional experiments are planned on the relationship of bleeding to storage life and palatability of fish fillets. It is probable that fish which have been iced have lost color because of the pressure and bleaching action of the ice when in storage aboard the vessels.

Salt Content of Fillets: In view of the "sea-salt" flavor noted in fillets prepared from round-frozen-thawed fish, a series of salt determinations (table 4) according to A.O.A.C. methods for fish were carried out on the fillets under study. The salt content (chloride expressed as NaCl) of fillets prepared from fish frozen in the round was greater than that of fillets from experimentally-iced and commercially-iced fish. Since all samples of fillets were brined in identical solutions for the same period of time when being prepared, it is conceivable that the lower salt content of iced fish is due in part to the leaching out of the salt in the

flesh by melting ice. There is also the possibility that the flesh of fish frozen in the round absorbed more brine than the flesh of fish iced. The higher salt content was not considered objectionable from the flavor standpoint.

Table 4 - Salt Content of Fillets Prepared from Round-Frozen-Thawed Experimentally-Iced, and Commercially-Iced Fish

Species of Fish	Treatment of fish on vessel	Chlorides, as sodium chloride in percent (Fish stored for 4 mos. in commercial storage—0° F.)
Haddock	Round-frozen	0.84
	Bled, round-frozen	1.09
	Experimentally gutted, and iced for 6 days.	0.78
Ocean Perch (Rosefish)	Round-frozen	0.71
	Commercially iced-round and iced for 10 days.	0.54
Cod	Round-frozen	0.61
	Experimentally gutted and iced for 10 days.	0.57
Hake	Round-frozen	0.74
	Experimentally gutted, headed and iced for 10 days.	0.50
Pollock	Round-frozen	0.78
	Experimentally gutted, gilled and iced for 10 days.	0.44

Effect of Prolonged Commercial Storage of Round Frozen Fish Prior to Thawing, Filleting, and Refreezing: It is well known that fish held in commercial cold storage 0° F. (-18° C.) for prolonged periods undergo certain physical changes that result in toughening of the flesh and increased moisture losses (drip) on thawing. In view of this it was felt that consideration be given to the length of time fish frozen in the round could be safely held at commercial storage temperatures, prior to defrosting and filleting, before adverse physical changes occurred in the refrozen fillet on further storage. Accordingly, samples of haddock and ocean perch were frozen in the round at sea, glazed, and stored at 0° F. for 10 weeks before thawing, filleting, and refreezing. Fillets from these round-frozen-thawed fish were packaged as described earlier and were compared with fillets prepared from haddock and ocean perch iced for 10 days after intervals of 1, 4, and 5 months in commercial cold storage.

The TMA content and free drip of the samples under test appear in table 5. It will be noted that the TMA values for haddock fillets prepared from round-frozen fish stored for 10 days and 10 weeks are extremely low and vary but little. This is also true for fillets prepared from experimentally-iced haddock kept in ice for six days. Likewise the TMA content of ocean perch fillets was low for fish stored for similar periods prior to thawing, filleting, and refreezing. It was noted that the flavor characteristics of the fillets under test were not altered.

The free drip of fillets prepared from ten-weeks old round-frozen-thawed fish increased significantly over that from fillets prepared from ten-day old frozen fish. For this reason, at least, fish frozen in the round should not be held for excessive periods in cold storage prior to thawing and filleting.

The limited data indicate that prolonged storage of round-frozen fish has an effect on the physical characteristics of the refrozen fillets, and commercial cold storage of the round fish should, therefore, be limited to a period not exceeding ten weeks prior to thawing and filleting.

CONCLUSION

These studies in general indicate that frozen fillets prepared from round-frozen-thawed fish are as good as or better in quality than fillets prepared from experimentally-iced and, in the case of ocean perch, commercially-iced fish. Larger-scale experiments to test commercial application of freezing round fish at sea are planned.

Table 5 - Trimethylamine Content and Free Drip of Stored Frozen Fillets Prepared From Round-Frozen-Thawed Fish after Ten Days and Ten Weeks Commercial Cold Storage as Compared to Fillets from Iced Fish

Species	Treatment	TMA, mg./100 g. Months in Storage at 0° F.			Drip (Percent) Months in Storage at 0° F.		
		1	4	5	1	4	5
Haddock	Round-frozen, stored 10 days, defrosted, filleted.....	0.5	0.3	0.4	0.2	1.8	2.2
	Round-frozen, stored 10 weeks, defrosted, filleted.....	0.3	0.2	0.1	2.3	5.2	4.1
	Experimentally iced, 6 days, filleted.....	0.8	0.4	0.8	0.6	1.4	1.8
Ocean Perch (Rosefish)	Round-frozen, stored 10 days, defrosted, filleted.....	0.3	0.0	0.1	0.3	1.8	1.8
	Round-frozen, stored 10 weeks, defrosted, filleted.....	0.1	0.1	0.2	2.3	3.6	3.3
	Commercially iced, 10 days, filleted.....	6.8	3.5	2.2	0.9	2.0	3.7

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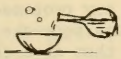


FREEZING FISH AT SEA--NEW ENGLAND

Part 2 - Experimental Procedures and Equipment

By H. W. Magnusson,* S. R. Pottinger,* and J. C. Hartshorne*

ABSTRACT

IN VIEW OF THE FAVORABLE RESULTS OF THE PRELIMINARY TESTS ON FREEZING-FISH-AT-SEA, FURTHER LABORATORY AND PILOT-PLANT STUDIES WERE CARRIED OUT TO SECURE DATA IN PREPARATION FOR A COMMERCIAL-SCALE INVESTIGATION. FOR FREEZING FISH AT SEA ABOARD THE SERVICE'S EXPERIMENTAL TRAWLER DELAWARE, THE METHOD OF FREEZING FISH BY IMMERSION IN COLD BRINE WAS ADOPTED FOR THE INITIAL TESTS. SALT PENETRATION INTO THE FISH MEAT DOES NOT SEEM TO BE A SERIOUS PROBLEM. THAWING THE FROZEN WHOLE FISH IN WATER (SO THAT THEY CAN BE FILLETED) SEEMS TO BE THE MOST PRACTICAL METHOD. ORGANOLEPTIC, PHYSICAL, AND CHEMICAL TEST PROCEDURES FOR JUDGING THE QUALITY OF THE FROZEN FILLETS ARE DESCRIBED.

INTRODUCTION

Small-scale experiments conducted by the Service's technological laboratories on the Pacific and Atlantic Coasts (Puncochar, 1949) indicated that uniformly good-quality fillets could be prepared from fish frozen aboard fishing vessels and then defrosted in shore plants. These preliminary trials were followed by a laboratory study which compared fillets prepared from fish frozen "in the round" aboard a vessel at sea, with fillets prepared from fish preserved at sea by the usual icing procedures (see Part 1). In these tests, which included five species of groundfish commercially important to the New England Area, the fillets from fish frozen at sea were found to be as good as, or better than, the fillets from corresponding lots of iced fish.

These highly encouraging experiments were, of course, on too small a scale to warrant their direct application to any proposed commercial operation. Therefore, the various possibilities and problems connected with freezing fish aboard a standard New England trawler and thawing them at a shore processing plant were reviewed in considerable detail. Pilot-plant and laboratory studies were conducted to secure data on which to plan the course of a commercial-scale investigation, taking into account the economic aspects of this method of preserving and processing fish.

In the preliminary experiments the fish were frozen individually on coils in still air; in most of the subsequent trials a more rapid freezing method, immersing the fish in refrigerated brine, was used. Fairly-large-scale brine-freezing tests suggested the design for a possible refrigeration system for a commercial vessel. These pilot-scale freezing studies are being continued to develop improvements and simplifications.

Studies of methods for thawing the fish have favored the use of water. After several tests employing single fish, the scale of the experiments was increased until semicommercial trial lots of several hundred pounds each were thawed. Pilot-plant-scale thawing trials are being continued to develop commercially-practical systems. Simultaneously, the scaling and filleting characteristics of the thawed fish

* TECHNOLOGIST, FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U. S. FISH AND WILDLIFE SERVICE, EAST BOSTON, MASS.

are being studied to determine whether any changes in the normal procedures are necessary or desirable.

All freezing and thawing methods are being evaluated on the basis of chemical, physical, and organoleptic tests in the laboratory. These tests should aid in providing the best estimate of the consumer acceptability of the final products.

FREEZING ROUND FISH

Choice of Freezing Method: A review of the literature, both technical and trade, indicated no specific information on satisfactory methods for freezing fish aboard a trawler at sea. However, there was considerable related information on which a choice for pilot-plant and vessel experiments could be made. Taylor (1927) presented a useful review of the advantages and disadvantages of several freezing methods. On the basis of this and miscellaneous other reports, four standard freezing methods were considered: (1) direct contact with a refrigerated liquid by immersion or spraying, (2) refrigerated coils or plates, (3) refrigerated air blast, and (4) refrigerated molds or plates.

After considering several variations of each of these four methods, it was decided first to concentrate research on studies of freezing fish by immersion in a refrigerated sodium-chloride solution. This system has several basic advantages for its use aboard a fishing vessel, where space and manpower are at a premium. Freezing in brine is rapid and the equipment required occupies comparatively little space. Because of the buoyant effect of the brine, the manpower and equipment needed to keep the fish separated during the freezing period are at a minimum. Also there are, at least theoretically, some advantages to freezing fish as rapidly as possible. Media other than solutions of sodium chloride, such as mixtures containing calcium chloride, alcohol, glycerol, or sugars, will be studied later. Sodium-chloride brine is being considered first, because it is known that the penetration of sodium chloride into the meat of the fish is only moderate and the penetration of sodium chloride could possibly be reduced to a negligible quantity with the optimum freezing conditions to be employed. The system of freezing with a spray of refrigerated liquid was not considered practical on a vessel because of the excessive space and the special equipment required and the labor needed to handle each fish individually.

Freezing on refrigerated coils or plates, one of the oldest and most common methods, has proved quite satisfactory for land installations. Even aboard a floating freezership it might be a highly satisfactory system, but on a standard commercial trawler the following disadvantages are important considerations: (1) the space required for the freezing room and the weight of the coils or plates would be objectionable; (2) the freezing rate is comparatively slow; (3) the fish must be stacked individually or in thin layers, requiring much space and manpower. It should be noted, however, that this system has one definite advantage: there is no machinery in the freezing room requiring attention.

Freezing in a blast of cold air is faster than on coils or plates, but not so rapid as in refrigerated brine. The space required is also intermediate between the other two. However, considerable manpower is needed to stack the fish individually and to transfer them from the freezer into the cold storage. Also more insulation would be required for a blast-freezer room than for a brine-freezer tank.

Refrigerated molds and compressing plates have been used successfully for packaged cut fish and for blocks of small whole fish. The main difficulty encountered in using this system for large fish is that the block is necessarily thick and therefore requires a long time to freeze. Also, the large heads of the fish make it

difficult to obtain direct contact of the thin tail portion of the fish with the frozen plates. In addition, an excessively long time is required to thaw these large blocks of fish. It is possible that a vertical-loading mold freezer could be designed which would require a minimum of handling, but the equipment would probably be quite costly and complicated.

Although it was determined to start the experimental studies on freezing by immersion in brine, the other methods are not considered impossible or impractical. The pilot equipment and the vessel installations were constructed so that modifications would be possible to permit a variety of studies.

Factors Affecting Salt Penetration: The penetration of salt into the fish is probably the principal reason that brine freezing is not more commonly practiced. The extent of salt penetration and its effect on the final product is being given thorough consideration in the present project. Because the absorption of salt is comparatively high at a cut surface or through the wall of the visceral cavity, it seems obviously desirable to freeze the fish whole. So long as there is no unusual spoilage attributable to the presence of viscera, this freezing method is evidently advantageous, for it should mean less work for the fishermen and delivery at port of potentially-valuable viscera in excellent condition. Preliminary trials demonstrated that the degree of salt penetration depended on the length of time the fish were in the brine, and on the strength and temperature of the brine. When fairly fresh haddock were frozen in brine at 5° F., the absorption of brine by the fish was not serious. In fact, after these brine-frozen haddock were thawed in fresh water, the final salt content of the meat of the fish was very nearly the same as in samples from fresh, unfrozen fish. Although the preliminary tests are encouraging, the problem is being considered in more detail as large lots of fish are frozen and thawed in the course of this project.

Rates of Freezing: In order to attain most efficient operation aboard the vessel and to keep salt penetration to a minimum, information on the factors affecting the rates of freezing in brine is required. Pilot-scale freezing trials are being performed in a specially-built, refrigerated, and insulated tank, with inside dimensions of 30 by 30 by 30 inches and a capacity of about 110 gallons. With brine at 5° F., the brine-freezing tank has a maintained freezing capacity of about 50 pounds per three hours.

As had been expected, the freezing trials demonstrated that circulation of brine around each fish was an absolute necessity; if the fish "packed" together the mass of fish acted more or less like a tremendously large fish, and froze very slowly. Therefore, for some trials, the tank was equipped with a rotating drum mechanism consisting of four sections, each having a radius of 12 inches and length of 24 inches. The rotator is adjustable to operate at several speeds. When the rotator is not used, the brine is circulated with a small water pump of 4-gallons-per-minute capacity. Circulation of the water with this pump did not adequately agitate the fish, which floated and "packed" because of the considerable difference in the specific gravities of fish and brine.

Although the need to keep the fish separated was demonstrated, the trials revealed no significant advantage to very high rates of flow of the refrigerated brine. When the rotator revolved at 5 r.p.m., the fish did not freeze noticeably faster than when the rotator operated at 1 r.p.m. On the basis of this information it was recommended that the rotator in the brine freezer on the experimental vessel need not be operated faster than 3 or 4 r.p.m. A slower rate was not recommended because of the resultant longer time required to shift from one sector to another during loading and unloading operations.

The effect of brine temperature and salt concentration on the rate of freezing is being determined in the experimental brine tank, with and without the rotator. The depth of freeze in the fish is experimentally determined, with an accuracy of 1/16 inch or better by simply cutting or sawing a cross section of the fish and measuring the width of the frozen portion. The line dividing frozen from unfrozen flesh is easily determined by sight and by touch. In preliminary trials, it was found that at 0° F. a depth of freeze of one inch on the side of a large fish required approximately one hour. Whenever the cross section was nearly circular, the width of the frozen portion was nearly the same at all points. On narrow fish, the depth of freeze was greater at the back and at the belly than on the sides. In circulating brine at +10° F. it required nearly 1½ hours to freeze the sides of a large fish to a depth of one inch.

The first freezing trials indicated that the rate of freezing varies with the depth already frozen, and the total time required to freeze to a given depth was roughly proportional to the square of the depth. On a large fish in circulating brine at 0° F., the first quarter inch was frozen in about four or five minutes; a half inch was solid after about fifteen minutes; while a full inch was frozen after about an hour. Data on the times required to freeze the usual sizes of cod and haddock are being determined under various conditions of brine concentration and temperature, movement of the fish, and so forth. The pilot-plant freezing tank and the vessel's brine tank will both be used in securing freezing-rate data.

THAWING FROZEN FISH

Methods: Of importance equal to the choice of satisfactory freezing methods is the determination of practical thawing methods. Three methods and their variations appear worthy of consideration as commercially useful for thawing fish which has been frozen at sea: (1) immersion in water; (2) exposure to the air; and (3) by dielectric heaters.

After reviewing the possible variations of these methods, it was concluded that first consideration should be given to thawing in circulating water, since (1) the rate of thawing would be moderately fast, (2) the operation in a commercial plant could be largely mechanized, (3) the cost of equipment and operation would be moderate, and (4) some of the salt introduced into the fish during freezing in brine would probably be removed.

Thawing in still air at room temperature requires little equipment, but the floor space involved is tremendous, the hand labor needed to spread the fish is costly, and the rate of thawing is slow. Use of an air blast would hasten thawing and consequently reduce the floor space needed; but the labor required would not be reduced, the fish would be more difficult to handle, and the moisture on the surfaces of the fish would evaporate more rapidly. If the air is heated the fish will thaw more rapidly, of course. However, there is the danger of changing the characteristics of the final product if too high temperatures are used. Complete data on air-thawing methods, and combination water-and-air-thawing methods will be obtained as a part of this phase of the study.

Thawing by use of dielectric heaters or other possible electronic systems might prove practical if the cost of suitable equipment is not excessive. Some difficulty may be encountered because of the wide variation of physical characteristics of the parts of fish: bone, flesh, oil-rich liver, etc. If these heaters are as efficient as some reports indicate, the electric power costs would not be unreasonable.

Rates of Thawing: In the experimental studies of thawing in water, the simplest equipment used was a sink or a pan, with water added from the tap. Tests with

50-pound lots of fish were carried out in the 110-gallon tank of the experimental brine freezer. Water was circulated by a 3- to 4-gallon-per-minute pump, by operation of the rotator, or by manual operation of a wooden paddle. Large-scale pilot plant operations are being conducted in a reinforced galvanized iron tank, which is 74 inches long, 34 inches wide, and 36 inches deep, with a bottom drain and an adjustable level skimmer. A 1/3 hp. centrifugal pump circulates water through six 3/8-inch holes in a manifold located along one side of the tank. With the tank full, about 32 gallons of water per minute are circulated at a pressure of about 10 pounds per square inch. This provides positive but moderate movement of the water.

Experimental trials for thawing single fish indicated the need for circulation of the water. In still water the temperature of the water within 1/8 inch of the fish dropped as much as 10° or 15° F. below the temperature of the mass of water. These drastic differences were eliminated by even, mild circulation of the water. Further increases in the circulation did not seem to increase the thawing rate markedly.

Thawing proceeds in a manner very similar to that described for freezing; however, the rates are comparatively slower. At 65° F. the first inch on the side of a large fish is thawed in approximately two hours. At 45° F. it required about five hours to thaw to the same depth. As with freezing, the rate of thawing decreases as the depth of thaw increases. A thawing temperature of 65° F. is being used as a base for further studies, since organoleptic tests had indicated no detrimental effects on the fillets of fish thawed at this temperature.

During the first few minutes of thawing, most of the fish tend slightly to float; after about 20 minutes, with few exceptions, the fish tend to sink. Because the fish are so nearly free floating, they are moved about by a minimum of circulation of water, providing there are not so many fish as to prevent movement. In the 400-gallon thawing tank, using the water circulation system earlier described, it is possible to thaw over 1,000 pounds in each batch. This is believed to be a sufficiently large lot to give data directly applicable to full-scale commercial operations.

FILLETING AND PACKAGING

Although a pilot-plant scale cutting and packaging room is being used for some studies, it is planned to conduct the principal processing trials in standard commercial plants. The fish will be thawed at the pilot plant and transported to one or more cooperating fish-filleting plants. Under this arrangement thawing will be conducted under controlled conditions and the further processing will be carried out by the fishing industry's experienced personnel using existing commercial equipment.

TESTING PROCEDURES

General: Preliminary reviews of the literature indicate a lack of entirely satisfactory methods for indicating quality and measuring certain changes that might occur in fish as a result of freezing or refreezing. It is known that freezing and storage, except in some cases where the storage period is very short, cause unavoidable deterioration in fishery products. This deterioration may be so slight as to be almost imperceptible or so pronounced that the products are unacceptable as food.

Insofar as related to this project, at least in the initial phases, the tests will be made on fish immediately after being frozen and after being held in frozen storage for varying periods of time. Any deterioration, if perceptible at all, will

probably be very slight. In view of the lack of entirely accurate and sensitive tests for distinguishing between small differences in quality of the meat of fish, the choice of testing methods is very limited.

Organoleptic Examination: Organoleptic-test procedures are to be used in this project as a basis for judging consumer acceptability of the various lots of fish. Such methods of testing are considered of basic importance since in the final analysis, appearance, flavor, and texture are the deciding factors as to whether a product is acceptable to the consumer. Such factors cannot be ascertained by objective tests alone. Organoleptic measurement of the quality of fish has been, and may continue to be, the first test applied for the determination of its grade. Although chemical and physical methods are often used, the primary standard of comparison goes back to the organoleptic tests.

Organoleptic tests are being conducted on lots of fillets prepared experimentally in the laboratory and those prepared under commercial conditions from fish brought in by the Service's experimental vessel Delaware. The results so far have shown only negligible differences in acceptability between fish frozen once and those thawed and refrozen. These results were obtained from tests conducted with a taste panel composed of laboratory personnel. Large-scale consumer acceptability tests are planned as the project progresses.

Physical and Chemical Methods: It is advisable to use, where possible, other indices of quality in conjunction with the organoleptic tests. Various attempts have been made by investigators at devising chemical and physical yardsticks for measuring quality changes in fish. While some such methods are reasonably satisfactory, they still serve merely as a check and as supplemental data to organoleptic measurements. In this connection, chemical and physical tests which appear to be applicable to the problem and which might correlate well with the organoleptic tests are being studied. The tests being considered first are press drip, free drip, dry matter in press drip, degree of toughening, salt content, trimethylamine content, and extractable actomyosin.

Press Drip: The quantity of liquid or "drip" that separates upon thawing frozen fish is often determined in connection with quality evaluation, especially for experimentally prepared fish. In a sense, it is a measure of the degree of breakdown of the cells of the meat of fish as a result of freezing and other processing. The determination of drip may be of value in showing differences in the quality of the fish as related to method of freezing, storage temperature, rate of thawing, and other factors.

Many methods of determining drip have been reported and it is doubtful if any two of them will give the same results. Since drip is generally determined for purposes of comparison, it is felt that as long as any one method is used for a given series of tests, the results should at least be comparable among themselves.

In this project, press drip (the liquid that separates from the fish during thawing when pressure is applied) is determined in a special piece of equipment designed, in part, in this laboratory. It consists essentially of a cylinder having an internal cross-sectional area of one square inch. A snug fitting plunger, with a detachable weight on top, fits into the cylinder. The combined weight of the plunger and weight is 10 pounds. In making a press drip determination, a plug of frozen fish meat, approximately one inch in thickness and of the same diameter as that of the inside of the cylinder, is weighed and placed in the cylinder. The plunger and weight are set in place and allowed to remain for fifteen minutes at a temperature of approximately 75° F. The fish thaws during this time. The liquid that separates from the fish runs off into a container. The plug of fish is then again weighed

the loss in weight due to pressing respresenting the quantity of press drip obtained.

Free Drip: The determination of free drip (the liquid that separates from the fish during thawing without applying pressure) is made by placing a portion of frozen fish fillet, previously weighed, on a wire screen in a closed container and allowing the fillet to thaw at approximately 75° F. over a period of 3½ hours. The difference in weight between the frozen and thawed product represents the free drip. This method obviously gives lower values than are obtained by the press-drip method. The combined values for drip by the two methods will also be considered in attempting to correlate the findings with the results of other tests. The differences in drip between lots have so far been too small to be of any consequence.

Dry Matter in Press Drip: It is thought that the quantity of soluble (dry) matter in the press drip may possibly vary as a result of the freezing and processing of the fish. The content of solids or dry matter in the press drip is being determined in order to ascertain whether this value might give some indication of the effect of refreezing on cellular breakdown in the fish flesh. The determination is being done in two parts, namely, the percentage of total solids and the percentage of salt in the drip. Only negligible differences in the total solids and salt content of the drip for different lots of fillets have been obtained.

Texture: In addition to determining texture of the samples by organoleptic means, this quality factor is being determined objectively. The measurement is made in a "tenderometer," a machine which exerts a shearing action on a sample of fish meat by means of a series of metal plates. A force applied to the plates causes them to shear or be forced through the sample of fish. A scale, reading in pounds, indicates the force required for the plates to shear the sample, this force being proportional to the degree of tenderness of the fish.

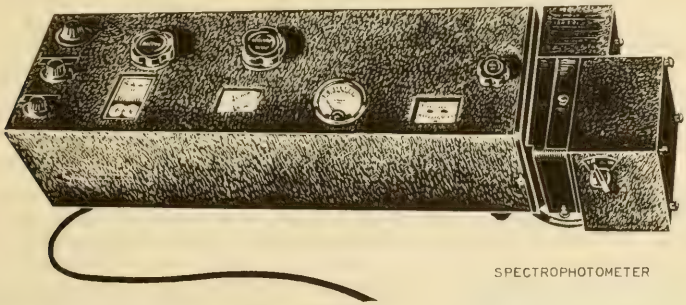
The tenderometer readings have shown very little difference between lots of fillets during the test period. There is some indication, however, that the readings as a whole are increasing as the storage period for the fillets increases. Further tests should indicate whether such a trend exists.

Salt Content: Freezing the fish in brine and thawing in fresh water make possible wide variations in the salt content of the resulting product. Through osmotic action there is a passage of salt from the brine to the meat of the fish. Likewise, the frozen fish containing this increased salt content will most likely lose some of this salt upon being thawed in fresh water. The extent to which the salt content of the fish increases or decreases as a result of these two operations is being determined by chemical analysis, using the method of the Association of Official Agricultural Chemists (1950) for salt in fishery products.

Samples of brine-frozen fish thawed in fresh water have indicated that the salt content of the fish meat will be reduced to approximately that of the meat prior to contact with the brine.

Trimethylamine Content: The muscle of marine fish contains trimethylamine oxide which, upon reduction by certain types of spoilage bacteria, is changed to trimethylamine. The muscle from very fresh fish contains practically no trimethylamine, but as freshness decreases there is a gradual rise in the content of this substance, reaching a concentration of about 15 milligrams per 100 grams of fish meat at the time the fish is considered unmarketable. The application of this determination to this project will be for the purpose of making a comparison of the trimethylamine content of frozen fillets prepared from the fish held in ice, with that of frozen fillets from the fish frozen immediately after being caught. These tests may give an

indication of the relative freshness of the products before the final freezing and storage. Although preliminary tests have indicated that trimethylamine values change very slowly in fish that have been frozen, this determination will also be made periodically on the fillets held in frozen storage. The determinations are being made by the spectrophotometric method.



SPECTROPHOTOMETER

Extractable Actomyosin: The amount of actomyosin (so-called "myosin"), a protein fraction of fish meat, which can be extracted by salt solution at room temperature, decreases as a result of freezing and frozen storage. This decrease in solubility is due to denaturation or internal changes in the protein brought about by the low temperature. By following the changes in solubility of myosin, an indication of the degree of denaturation of the fish protein may be obtained. It is thought that this determination may be of some value in this project in showing possible effects of refreezing on protein denaturation. Due to a delay in obtaining suitable equipment for large-scale separation of liquid and colloidal phases required in this determination, the work so far has been only preliminary and the accuracy has not been such as to permit close comparison of results.

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FREEZING FISH AT SEA--NEW ENGLAND
Part 3 - The Experimental Trawler Delaware and Shore Facilities

By C. Butler,* J. F. Puncochar,** and B. O. Knake***

ABSTRACT

A DESCRIPTION OF THE SERVICE'S EXPERIMENTAL TRAWLER DELWARE IS PRESENTED, INCLUDING THE GENERAL CHARACTERISTICS OF THE VESSEL, ALTERATION OF THE FISH HOLD, AND THE REFRIGERATION SYSTEM. ALSO DESCRIBED ARE THE SHORE FACILITIES, WHICH CONSIST OF THE PIER FOR MOORAGE OF THE VESSEL; A PILOT PLANT; A LABORATORY; AND OFFICES. OPERATION OF THE VESSEL AND FREEZING FACILITIES, AND HANDLING OF THE FISH ASHORE ARE DISCUSSED.

THE EXPERIMENTAL TRAWLER

GENERAL: The trawler Delaware being used in the current freezing-fish-at-sea studies by the Technological Section of the Service's Branch of Commercial Fisheries is well known to the New England fishing fleet. A vessel of this type was chosen for very definite reasons. It is our purpose, at this time, to develop fish-freezing and handling methods which are adaptable to the present New England fishing vessels rather than to work out methods of freezing and handling that would require the extensive conversion of these trawlers or the redesigning and building of new fishing vessels.

The characteristics of the Delaware are as follows:

LENGTH OVER-ALL - 147 FEET 6 INCHES
BEAM - 25 FEET
DEPTH - 14 FEET 8 INCHES
DEAD-WEIGHT TONNAGE - 544 TONS
MAIN ENGINE - 7 CYLINDER, 2 CYCLE, 735 HP., 300 RPM.
AUXILIARY LIGHTING GENERATORS - 2 IDENTICAL UNITS:
4 CYLINDER, 4 CYCLE, 39 HP., 1150 RPM., DIESEL ENGINES, DIRECTLY COUPLED TO D.C. GENERATORS OF 25 KW. CAPACITY OF 1,200 RPM., RATED AT 200 AMPERES AND 125 VOLTS.
TRAWL-WINCH POWER - CONSISTS OF A NEWLY-INSTALLED DIESEL ENGINE, 6 CYLINDER, TWO-CYCLE, 120 HP., 1,200 RPM., DIRECTLY CONNECTED TO A D.C. GENERATOR OF 80 KW. CAPACITY AT 1,200 RPM., RATED AT 320 AMPERES AND 250 VOLTS. THE WINCH, IN TURN, IS DRIVEN BY A 100 HP. ELECTRIC MOTOR.
FRESH-WATER TANK CAPACITY - 11.9 TONS
FUEL-OIL TANK CAPACITY - 63.2 TONS
LUBRICATING OIL TANK CAPACITY - 400 GALLONS
CRUISING RANGE - 8,000 NAUTICAL MILES
SPEED - APPROXIMATELY 10 KNOTS
CREW ACCOMMODATIONS FOR 20 PERSONS

Upon its delivery to the East Boston Laboratory, the vessel required the following alterations and repairs:

1. REMOVAL OF FISH-LIVER-OIL PROCESSING EQUIPMENT, WHICH OCCUPIED HALF OF FORMER GALLEY SPACE.

2. RESTORATION OF GALLEY TO FULL SIZE AND RE-EQUIPMENT WITH NEW RANGE, TABLE, AND CUPBOARDS.

3. RESTORATION OF DECK GEAR TO NEW ENGLAND STANDARD TYPE.

4. REPLACEMENT OF FOREIGN ECHO-SOUNDING EQUIPMENT WITH AN AMERICAN-MADE DEPTH RECORDER AND A DEPTH INDICATOR, BOTH WITH DUAL RANGE - 250 FEET AND 250 FATHOMS.

5. REPLACEMENT OF THE DIESEL ENGINE IN THE DIESEL-ELECTRIC POWER UNIT WHICH DRIVES THE TRAWL WINCH.

* TECHNOLOGIST,
** CHIEF, NORTH ATLANTIC TECHNOLOGICAL RESEARCH, } FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U.S. FISH AND WILDLIFE SERVICE, EAST BOSTON, MASS.
*** FISHERY ENGINEER,

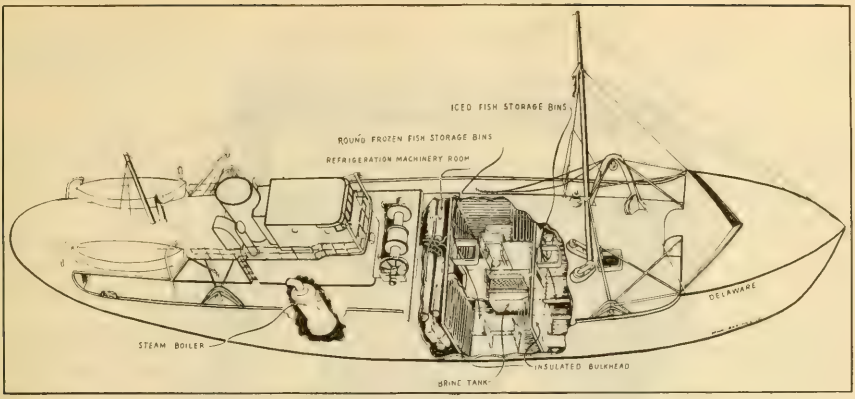


FIGURE 1 - CUTAWAY VIEW OF THE DELAWARE, SHOWING LOCATION OF THE REFRIGERATION SYSTEM AND STORAGE BINS.

ALTERATION OF THE FISH HOLD: The fish hold of the Delaware was originally about 36$\frac{2}{3}$ feet long with a total volume of 8,200 cubic feet. In this space was constructed (for the freezing-fish-at-sea project) a refrigeration machinery room and a frozen-fish storage space (Figure 1).

The refrigeration machinery room consists of the area formerly occupied by the after fish-pen section. This room is about 5 feet wide and occupies the entire cross-section of the fish hold immediately in front of the fuel-storage tanks, for a total of 1,300 cubic feet.

The balance of the fish-hold area (forward of the bulkhead installed to make the refrigeration machinery room) was divided equally by means of a second insulated bulkhead to provide, in the after portion, frozen-fish storage space. A brine-freezer unit was also installed in this frozen-fish storage area, which is approximately 15 feet long and has a total capacity of 2,800 cubic feet. The frozen-fish storage area, exclusive of the space occupied by the brine-freezer tank and the work areas essential to its use, will provide frozen-storage space for approximately 100,000 pounds of round fish.

The forward portion of the divided fish-hold area was left in an unaltered condition to provide space for the icing of gutted fish in the usual method. This space now totals approximately 3,000 cubic feet and can carry up to 132,000 pounds of iced, gutted fish.

THE REFRIGERATION SYSTEM: The refrigeration system aboard the M/V Delaware may be considered to have four main parts:

1. THE BRINE TANK FOR FREEZING ROUND FISH.
2. THE COOLING-COIL SYSTEM IN THE FROZEN-FISH STORAGE HOLD.
3. THE REFRIGERATION PLANT.
4. THE REFRIGERANT EVAPORATORS FOR COOLING THE BRINE AND THE ALCOHOL-TYPE MEDIUM IN THE COOLING-COIL SYSTEM.

Brine Freezer: The brine freezer tank is 5 by 5 by 10 feet, constructed by 1/2-inch welded steel plates (see Figure 2). The tank is mounted on steel channels secured to the pen-board stanchion posts. The location of the tank is between No. 2 and No. 3 hatch and on the center line of the vessel at the finished floor level in

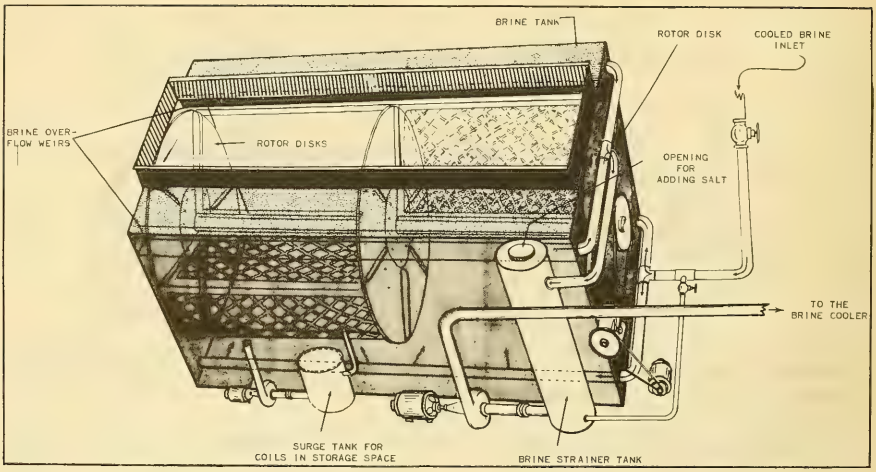


FIGURE 2 - BRINE-FREEZER TANK SHOWING ROTOR AND BRINE CIRCULATING EQUIPMENT.

the refrigerated fish-storage area (see Figure 1). Inside the rectangular tank proper there is mounted (on suitable bearings) a rotor 4 feet 8 inches in diameter fastened at each end of the tank. The rotor is divided into two sections of equal length. Each of the sections is further divided into six V-shaped segments. These segments provide support for V-shaped baskets which are constructed of welded angle-iron frames and covered with expanded metal lathe. Twelve baskets, six in each section, make up the complete rotor in the brine-freezer tank. The baskets are secured to the discs at the ends of each segment of the rotor and are equipped with a rounded-surface lid on the curved top. Fish to be frozen are loaded through the lid opening; the lid is then secured with a metal clamp. These baskets are designed in such a manner that they may be removed from the rotor individually, if necessary.

The drive mechanism for rotation of the rotor in the refrigerated brine consists of a large pulley driven by a triple V-belt from a gear-reduction unit, which is in turn V-belt driven from a 2-hp. motor. The speed of rotation for the rotor is about 3 rpm.

Located at the after corner on the port side of the brine tank is a cylindrical strainer unit 20 inches in diameter by 5 feet in height into which the brine overflow from the brine tank discharges. The outlet from the bottom of the strainer tank is coupled directly to a centrifugal pump driven by a 2-hp. motor and by means of which the brine is circulated back to the brine cooler in the refrigeration machinery room, aft.

On the top of the brine tank there is a walkway (approximately 15 inches wide) on each side to accommodate workmen engaged in loading and unloading the fish at the brine freezer. The actual opening of the tank is approximately $2\frac{1}{2}$ by 10 feet. A light-weight metal cover is provided to minimize sloshing of the brine out of the tank with the roll of the vessel and to eliminate the possibility of foreign matter falling into the tank when the equipment is not in use.

At the after end of the brine-freezer tank and immediately below the No. 3 hatch at the approximate level of the top of the tank there is located a work platform to

facilitate loading the fish from the deck into the brine freezer and to provide ease in movement of the workmen from the freezer room into the refrigeration machinery room aft.

Frozen-Fish Storage Area and Cooling-Coil System: The frozen-fish storage area is approximately 15 feet long fore and aft, and occupies the entire space athwartships with the exception of the area occupied by the brine-freezer tank and the circulating pumps for the brine and the alcohol-type medium of the refrigerated coils. The tank and pumps occupy approximately 800 cubic feet of the 3,600 cubic feet in the refrigerated storage area. The liquid medium used in the refrigerated-hold coils is ethanol. Other liquids with a low freezing point and suitable viscosity could be used. For this reason and for our convenience in the presentation of this report, the alcohol medium will be referred to as the "antifreeze."

In order to isolate the frozen-fish storage space, two bulkheads were installed. The after bulkhead separates this area from the refrigeration machinery room. This bulkhead consists of four inches of cork-board insulation installed in two 2-inch layers with moisture-vapor barrier paper laid up in hot asphalt on the warm (after) side of the cork. The protective surface on the cold side of this bulkhead is 1½-inch tongue-and-groove planking. A second such layer of planks laid with white-leaded joints provides the protective surface on the warm side of this bulkhead. Vertical studs, 4 by 6 inches on 16-inch centers, provide an additional strengthening feature.

A removable plug, approximately 5 by 4 feet, is located in the after bulkhead into which there is constructed a standard refrigerator door, approximately 24 by 56 inches, that opens from the refrigeration machinery room into the refrigerated storage area at the work-space level under the No. 3 hatch.

The forward bulkhead of the refrigerated storage space is built on the penboard stanchion line across the vessel at a point 15 feet forward of the after bulkhead. Details of construction were similar to those described for the after bulkhead except that the vertical stud reinforcement feature was omitted. In this bulkhead there is also a small refrigerator door which opens into the iced-fish storage area at the work-space level of the brine-freezer tank.

The refrigeration system for the frozen-fish storage area consists of a series of 1¼-inch coils of pipe with return bends on 4-inch centers. These sets of coils are bolted approximately 2 inches out from the wood surfaces and are secured to them on the after bulkhead, the forward bulkhead, the deckhead, and the port and starboard surfaces in this area. There are, however, no cooling coils on the deckhead above the brine-freezer tank. The total length of the refrigerated coils in the room is about 2,400 feet.

On the forward end of the brine tank on the port side, there is mounted a centrifugal pump driven by a 1/2 hp. motor. This unit supplies the propulsion force to circulate the "antifreeze" liquid used to provide the refrigeration in the frozen-fish storage area.

One-inch moisture-resistant plywood partitions on the stanchion posts on both sides above the brine-freezer tank create a series of storage bins into which the frozen fish may be segregated as to size and species. Doors are provided in these partitions for access to each of six such bins. Through use of the existing vertical penboard-stanchion supports between the three pens on each side of the brine-freezer tank, a positive separation can be obtained in the frozen fish, if necessary. A further separation can be made through the use of additional penboards placed horizontally at levels of approximately five feet from the finished floor in the re-

frigerated storage space. On the port side of the brine-freezer tank there is provided a wood-partition protection for the two centrifugal pumps and motors, for the strainer unit, and for the connecting pipes of the two circulation systems.

Based on past experience elsewhere with brine-frozen fish, there appears to be no need to provide battens to keep the fish from direct contact with the refrigerated coils, since the fish, upon removal from the brine, will be at the approximate temperature of the storage room coils, namely 5° F. In order to minimize any possible shifting of the frozen stacked fish in rough weather, the frozen fish will be sprayed with fresh-water which, in turn, should freeze and bind the fish together.

Refrigeration Machinery: The refrigeration machinery room is located between the frozen-fish storage area and the main engine room.

Access to this area from the main engine room is through a small watertight door installed in the watertight bulkhead between the fuel-storage tanks. The forward bulkhead contains the refrigerator door leading to the frozen-fish storage area and brine tank.

An absorption refrigeration system was installed. The absorption-type system was chosen over the conventional compressor system since this type of refrigeration equipment costs less to install and operate; requires much less electric power, an important factor aboard ships; is believed to occupy proportionately less space; and avoids the necessity for "staging" the system to obtain continuing maximum refrigeration capacity at the low temperature levels. The several parts making up the absorption-system plant are shown on the left hand side of Figure 3.

A brief explanation of the manner in which the system operates is as follows: The source of power in the absorption system is supplied by steam from a low-pressure boiler located in the main engine room aft of the refrigeration machinery compartment (see Figure 1). The steam enters the system (Figure 3) at the generator in which there is maintained a specified amount of concentrated aqueous-ammonia solution by means of an automatic-level control valve. The heat energy supplied by the steam vaporizes the ammonia and the water in the generator. These constituents pass off to the specially designed distillation column. As the water and ammonia vapors pass up through the successively cooler zones in the column, the water vapor is condensed (water has the higher boiling point). The condensed water ultimately drops to the bottom of the distillation column, and is returned to the generator. The ammonia vapor, passing upward, becomes more and more concentrated. At the top of the column, liquid ammonia is supplied from the ammonia condenser through a reflux meter. The passage of the ammonia vapor over this liquid ammonia insures that any vapor passing upward from the column will constitute approximately 99.95 percent ammonia. The ammonia vapor passes from the distillation column to the condenser where it is cooled and condensed to liquid by means of coils supplied with running sea water as a coolant. The liquid ammonia from the condenser passes downward, as indicated, to the ammonia receiver (shown on the right-hand side of the drawing). However, a sufficient portion is diverted to the distillation column to supply its need for liquid ammonia. The liquid ammonia is supplied from the receiver to the brine and "antifreeze" coolers in accordance with the refrigeration needs. The evaporation of the liquid ammonia in the heat exchangers' tubes provides the refrigeration for the circulating brine and "antifreeze." The ammonia vapor then passes on to the absorber unit.

The absorber is a specially-designed heat exchanger of the shell-and-tube type in which sea-water supplies the cooling medium. The absorber shell is charged with a weak aqua-ammonia solution into which the vaporized ammonia from the brine and "antifreeze" coolers is absorbed. The enriched aqua-ammonia solution is next drawn from

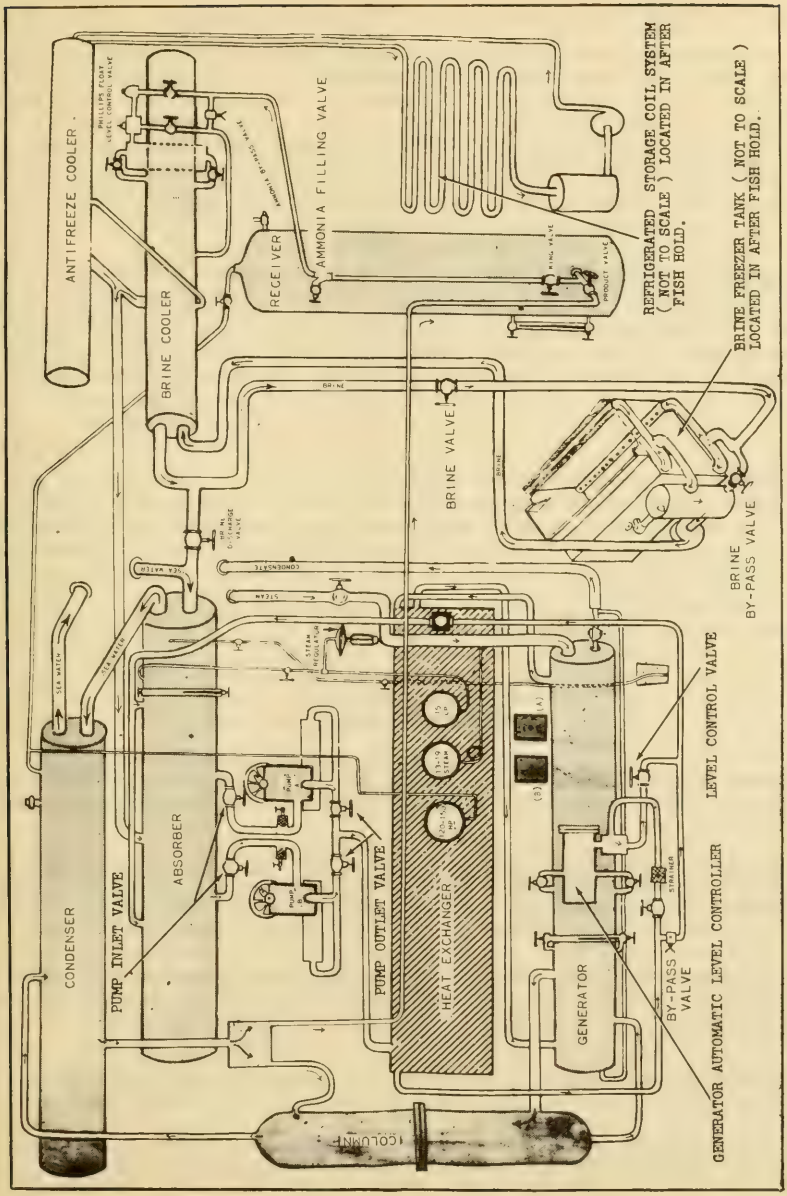


FIGURE 3 - DIAGRAMMATIC VIEW OF REFRIGERATION SYSTEM.

the absorber by the specially designed pump, passed through a counterflow heat exchanger where it is warmed, and then introduced into the generator.

The proper levels of the liquids in the generator and in the absorber are maintained through the correct balance in the operation of the aqua-ammonia pump delivering the concentrated liquid from the absorber to the generator, and in the return of the weak aqua-ammonia solution from the bottom of the distilling column via the generator, thence through the heat exchanger and back to the absorber in a cool condition to resume the absorption cycle. Once this system is in balance, the operation of the refrigeration cycle continues so long as the steam is supplied to the unit, and either or both of the two refrigeration systems continue to supply heat for removal in their respective heat-exchanger coolers.

Brine and "Antifreezer" Coolers and Circulating Systems: The two refrigerant evaporators, located in the refrigeration machinery room, are standard tube-and-shell-heat exchangers in which the liquid ammonia evaporates, cooling the brine and "antifreeze" liquid as they pass through. The proper ammonia level in each is maintained in the evaporators by the Phillips float-level control valve connected to the brine cooler and by the equalizing pipe connection to the "antifreeze" cooler (see Figure 3).

The pipes carrying the refrigerated brine pass through the forward bulkhead of the refrigeration machinery room to the brine-freezer tank. The brine is introduced through two 4-inch pipes located in the bottom of the tank. Inside the tank each of these 4-inch pipes have a row of perforations 1 inch in diameter and 6 inches on centers. The return line is supplied with brine through two 6 by 6-inch launders mounted at the sides inside of the tank and slightly below the top level of the tank. On the port side of the tank, the returning brine passes through a large strainer unit where any extraneous material is removed. The brine then enters the circulating pump and is transported back to the brine cooler. Salt, to bring the brine to the desired concentration, is added through this strainer.

The cooled "antifreeze" liquid passes through the same bulkhead to the cooling coils. After the antifreeze solution has completed its passage through all of these pipes to pick up heat from the storage space, it returns again to the refrigerant-evaporator cooler.

The refrigeration load to these two coolers is adjusted to provide 20 tons of refrigeration per 24 hours to the brine system and 5 tons to the refrigerated-area cooling-coil system.

OPERATION OF THE VESSEL AND FREEZING FACILITIES: The Delaware is being operated, insofar as fishing technique is concerned, in the standard manner of a New England trawler. When the fish are discharged from the cod end, they are sorted according to size and species and washed just as on any other of these vessels. For our tests, each species of fish is divided into two equal lots. The first lot of each species so separated is gutted and iced for storage in the iced-fish storage portion of the hold in accordance with regular good commercial practice. Each lot of fish is assigned an identification number. These samples will serve as the "controls" for comparison with the fish frozen in brine.

The second lot of washed round-fish of each species are assigned a corresponding identification number and then loaded in batches of approximately 200 to 250 pounds per basket to the pre-cooled brine-freezer tank. As soon as the 12 baskets are filled, the rotor is placed into operation and the fish held in the brine until frozen. The length of time they are in the brine depends upon the species and size of the particular fish being processed. After the fish are frozen, they are removed

from the baskets and stored in the refrigerated-storage space which has been previously brought to the holding temperature of 5° F. Each lot of fish as it is removed from the brine freezer is segregated in the hold in order to retain its identity for subsequent tests and comparisons with its "control" in the gutted-iced-fish hold.

Preliminary trial runs indicated that the brine freezer will have a total capacity of approximately 2,500 to 3,000 pounds of round fish and will require from one to three hours for the freezing cycle. Based upon the estimated average catch of fish per haul (1,500 pounds), six baskets in the rotor can be filled from the first haul and during the course of the next dragging operation these fish will be freezing. If the first lot of fish has not completely frozen by the time the second haul has been completed, due to large sizes or for other reasons, the fish may remain in the baskets while the second lot of fish is loaded and during the beginning of the freezing phase. Through this arrangement it is possible to allow as much as three hours for the freezing of a given lot of fish with little, if any, dislocation of the continuous freezing cycle provided, of course, that no unusually large hauls of fish are made. In the event that more fish are landed on deck than can be immediately frozen, that part of each lot set aside for freezing in the round will be segregated in the iced-fish hold and iced until the freezing facilities are available.

The refrigeration system has been designed and built to preclude changes in the brine-tank temperature in excess of two to four degrees under normal operating conditions. Although the brine temperature in the system may rise from two to four degrees when the unfrozen fish are introduced, the capacity of the system is such that within a few minutes the temperature will be lowered to its operating level.

After the vessel has completed the fishing and freezing operation at sea, it will return to the dock at the East Boston Fishery Technological Laboratory where the corresponding lots of iced-gutted fish and round-frozen fish will be removed for processing ashore.

SHORE FACILITIES

PIER, PILOT PLANT, LABORATORY, AND OFFICES: The shore facilities at the East Boston Laboratory include moorage for the vessel, a laboratory, a pilot plant, and offices (see Figure 4).

The pier, constructed of wood piling with wood decking, is approximately 15 feet wide and 400 feet long. The depth of the water, from the 50-foot mark on the pier to the end of the pier, is great enough to provide safe moorage for the Delaware at any tide stage. The main ship channel through Boston harbor is located within 300 feet of the end of this pier.

The fish-processing facilities ashore, at a distance of approximately 150 feet from the shore end of the pier, include sufficient space and equipment for (1) the holding (not freezing) of up to 10,000 pounds of frozen fish in a low-temperature storage room; (2) the water-thawing of frozen fish in 1,000-pound lots; and, (3) the cutting and packaging of fish on a pilot-plant scale. In the same building there are the fishing gear loft, the vessel stores space, and other essential auxiliary facilities.

In the adjacent building, the Administrative Offices are located on the ground floor. The testing laboratory, together with other office space, is on the third floor.

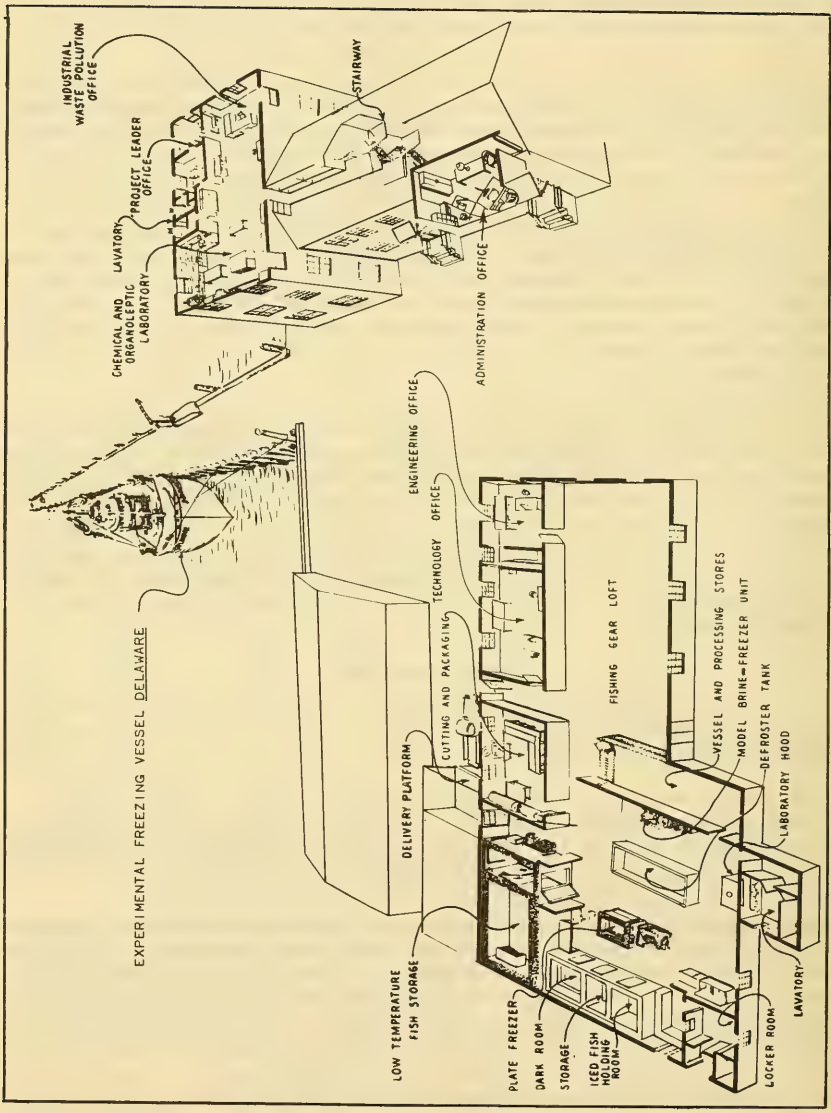


FIGURE 4 - CUT-AWAY VIEW OF THE FISHERY TECHNOLOGICAL LABORATORY, EAST BOSTON, MASSACHUSETTS, SHOWING OFFICE, LABORATORY, AND PILOT-PLANT FACILITIES; THE DOCK; AND THE EXPERIMENTAL TRAWLER DELAWARE.

HANDLING FISH ASHORE: The frozen fish aboard the Delaware upon their return to port are trucked from shipside to the low-temperature storage room in the pilot-plant building. These fish may be removed and water-thawed as required for filleting and packaging in the pilot plant where equipment and space for one scaler, two cutters, and one packager are available. Alternatively, the thawed fish may be trucked to a commercial filleting plant immediately after thawing. In either instance the packaged fillets, except small lots for special experiments, are frozen and stored in commercial cold-storage plants. A cold-storage box with sharp freezing capacity of 200 pounds and storage capacity of about 600 pounds of fish is used for special experiments on small lots.

Iced fish landed from the Delaware may be cut and packaged in the pilot plant or trucked directly to a commercial plant for filleting, packaging, and freezing.

Representative samples of fillets from the iced fish and from the thawed fish are taken to the laboratory for physical, chemical, and taste-panel evaluation. These results on the fish at the initial stage of processing then serve as a reference point for evaluation with subsequent samples from the corresponding lot in frozen storage. Each examination and evaluation is made semi-monthly for nine months.

PACKAGING FROZEN FISHERY PRODUCTS

The low temperatures which are required for proper storage of frozen fishery products and frozen foods in general will cause extreme desiccation or drying out unless special preventive precautions are taken. The humidity of the air in a frozen-storage room is quite low. On the other hand, the air immediately surrounding the frozen food is practically saturated with moisture. The dry air in circulating through the room will pick up any moisture that is available. Any exposed or improperly packaged food products in the room will thus lose moisture, in the form of water vapor, and will rapidly develop a dry, spongy and discolored surface. The tissues become tough due to denaturation or irreversible changes in the protein. This condition is known as "freezer burn." The package is of prime importance in order to prevent this drying. Care is needed to package the food properly in containers which have a very low or - ideally - a zero rate of water-vapor transfer, so as to keep the moisture where it belongs - within the package.

--Fishery Leaflet 324

FREEZING FISH AT SEA--NEW ENGLAND
Part 4 - Commercial Processing of Brine-Frozen Fish

By Charles Butler* and Harris W. Magnusson*

ABSTRACT

RESULTS OF THE FIRST SEMICOMMERCIAL-SCALE PROCESSING OF ROUND BRINE-FROZEN SCROD HADDOCK UNDER NORMAL FILLET-PLANT OPERATING CONDITIONS ARE DISCUSSED.

INTRODUCTION

This report presents preliminary data and observations resulting from the first semicommercial-scale processing of fish caught and frozen in the round on the Delaware during the fall of 1951. The Service's technological research vessel Delaware (a New England-type trawler) is equipped to brine freeze and store round fish frozen at sea.

FREEZING ROUND FISH IN BRINE

The M/V Delaware operated in the North Atlantic, using standard otter-trawl gear identical to that of the commercial fleet working out of Boston. The fish, when brought on deck, were sorted into these categories: scrod haddock, large haddock, market cod, and flounders. Other miscellaneous fish taken in the trawl were also segregated.

HADDOCK

The major portion of the catch during this period of fishing was scrod haddock; therefore, the emphasis in this particular study was placed on this variety. When the size of a haul was 1,000 to 1,500 pounds, the scrod haddock were divided into two approximately equal lots. The first lot was immediately washed and put into the brine-freezer tank, in approximately 200-pound units for each segment of the rotor. The brine in the tank had previously been brought to 6° F. As soon as the fish were loaded into the brine freezer, the rotor (see Part 3, pp. 16-25) was started. The fish were kept in motion in the chilled brine until completely frozen. After freezing, the fish were then removed from the brine and stored at 20° F. in the refrigerated area located in the after part of the fish hold. The second lot of scrod haddock from the same drag was dressed and iced in the forward part of the fish hold in accordance with normal New England trawler practice.

Whenever an insufficient amount of scrod haddock was taken in a single drag, the fish from one drag were dressed and iced, and those from the next drag were frozen round as prevously described. Since the area in which the fish were taken was the same in both cases, it is believed that no significant variable was introduced by using fish from separate drags to build up stocks of fish for comparison studies.

The other species, such as large haddock, cod, pollock, hake, and flounder (which were caught in minor amounts), were frozen in the same manner as the scrod haddock. These fish were also stored in the refrigerated hold.

* TECHNOLOGIST, FISHERY TECHNOLOGICAL LABORATORY, BRANCH OF COMMERCIAL FISHERIES, U.S. FISH AND WILDLIFE SERVICE, EAST BOSTON, MASS.

After approximately 4,000 pounds of frozen scrod haddock and 2,000 pounds of other frozen fish were accumulated, the vessel returned to port. As soon as the vessel docked, the round brine-frozen fish were transferred to storage at 0° F. in the cold-storage room at the laboratory. In order to simulate the usual commercial fleet 8- to 10-day cruise period, the iced fish stored in the forward part of the fish hold were left aboard the docked vessel for a total of five days.

PROCESSING FISH ASHORE

ICED FISH: The iced fish were removed from the fish hold, freed of ice in the pokes, placed in boxes, and hauled to a commercial fish-filleting plant where they were processed. At the plant the fish were weighed, scaled, filleted, and packaged in accordance with the company's standard commercial operating procedures. Laboratory-staff members checked on all phases of the operation. The foreman of the plant indicated that this lot of iced fish was equal in quality to the better lots of iced fish normally received from the commercial fishing vessels.

The general appearance and quality of the fillets was comparable in all respects to fillets of good quality prepared in the Boston area. The yield of fillets, using the "half nape" cut for filleting, was 47 percent of the dressed fish weight.

The packaged fillets were delivered to a commercial cold storage plant in Boston where they were frozen and stored.

FROZEN FISH: The brine-frozen fish were held in cold storage for a total of seven days; that is, two days on the vessel at 20° F. and five days in the laboratory cold-storage room at 0° F. At the end of this period, one lot of the round brine-frozen scrod haddock was removed and thawed at the laboratory pilot plant. Approximately 1,000 pounds of fish were put into a galvanized-iron thawing tank, measuring 3 by 3 by 8 feet, containing cold city tap water. A small centrifugal pump in one corner of the tank imparted movement to the water during the thawing process. For this lot of fish the water in the thawing tank was held at about 53° F. by the regulated addition of hot and cold city water; some water was discharged to make room for the added water to maintain the chosen thawing temperature.

The rate of thawing of round brine-frozen fish will be discussed in detail in another report. Suffice it to say that this lot of fish was in the thawing tank at the temperature indicated for 3¾ hours. Previous experiments with fish of this size group at this thawing temperature had established this time as adequate to complete the thawing operation.

At the end of the thawing period the fish were removed from the tank, placed in wooden boxes, weighed, and transported to the commercial filleting plant. Staff members, as before, were present at the plant during the processing of the round brine-frozen fish. They made their own observations at each stage and also secured comments from the workers engaged in each operation. The scaling-machine operator was of the opinion that the round brine-frozen fish scaled with less hand motions than the dressed fish and the scaling was just as thorough. In filleting, the "half nape" cut was used as in the case of the iced scrod haddock. The filleters encountered little if any difficulty in adapting their technique to the round fish. They did comment that the fish were considerably firmer than the iced-dressed fish normally delivered by the commercial fishing vessels. The filleting operation was completed within three hours from the time the fish had been removed from the thawing tank. The plant foreman indicated that the time required to process this lot of fish was comparable to that for an equal amount of dressed fish.

The fillets were carefully examined prior to packaging. No significant differences in appearance were noted between the fillets from the brine-frozen fish and those from the iced fish. The fillets were packaged in an identical manner to that used for the fillets from the iced fish.

The remaining body portions of the fish were collected and the viscera were removed and weighed. These data provided the necessary information to allow calculation of the fillet yield on the dressed fish basis. The amount of visceral material obtained was 10 percent of the weight of the round fish. Yield of fillets from this lot of fish was 49 percent of dressed (not round) fish weight.

A second lot of round brine-frozen scrod haddock was thawed substantially in the manner indicated above except that water at 72° F. was used and maintained at about this temperature during the thawing period of 1¾ hours. This lot of thawed fish was boxed, weighed, and transported to the fillet house for processing in the manner described above for the first lot of round brine-frozen fish. So far as could be determined by the laboratory-staff members and the foremen at the plant there was no significant difference between the second lot of round brine-frozen fish and the first except that the second lot seemed to be slightly less firm. Comments of the workers otherwise were similar to those made for the first round brine-frozen lot. The yield of fillets was 47 percent of dressed fish weight. The appearance of the fillets was pronounced as normal by the company workers and the foreman. Wrapping, packaging, and freezing of the fillets were according to the standard procedures of the company.

The balance of the round brine-frozen scrod haddock was processed in two lots of approximately 1,000 pounds each. Fillet yields were 47 percent of dressed-fish weight in each instance. Observations and comments were substantially the same as for the first lot of round brine-frozen fish processed.

The data as regards yield of fillets from round brine-frozen scrod haddock are presented with reservations, since it is to be expected that the filleters in the plant would either consciously or unconsciously be influenced by the fact that laboratory technologists were observing the operations, and by the fact that the fish represented an experimental lot. Under these conditions, it is entirely possible that the filleters might make a special effort to improve their workmanship, resulting in greater fillet recovery.

The samples of the packaged frozen fillets are now in storage at a commercial cold-storage plant in Boston where they will be held at a temperature of -10° to 0° F. for a period of six months. At intervals of two to six weeks, samples of each of the lots will be taken to the laboratory for comparison by means of taste-test panels. Free drip, press drip, and possibly other physical or chemical methods of evaluation and comparison will be used to supplement these taste tests.

The taste-panel results on the comparison of the fillets from the iced fish versus the fillets from the round brine-frozen fish after three months of storage indicate that there is no significant difference in flavor or appearance. The texture (as measured by resistance to shear) of the fillets from each lot of fish had, however, increased significantly in toughness at the three-month examination as compared with the texture at the previous examinations.

SMOKING OF FILLETS: The commercial processor tested a portion of the fillets obtained from the round brine-frozen haddock for their suitability for the preparation of finnan haddie. The processing procedure standard for that company was used. Finnan haddie prepared from the brine-frozen fish were compared with those prepared from iced fish. The finnan haddie prepared from these two lots was substantially

comparable, except that the processor observed a somewhat less pronounced sheen on the finnan haddie prepared from the brine-frozen fish. He stated, however, that this desirable sheen could possibly be obtained with the round brine-frozen fish by a minor adjustment in the technique of preparing the finnan haddie.

Some of the other miscellaneous species taken in the trawl, such as cod, pollock, and hake, were filleted and smoked by this same processor. Again the smoked fillets prepared from brine-frozen water-thawed fish compared very favorably with smoked fillets of the same species prepared from iced fish.

SUMMARY

The following observations seem to be warranted on the basis of the results of the first semicommercial scale processing of round-brine-frozen scrod haddock under normal fillet-plant operating conditions:

1. Round brine-frozen scrod haddock offer no complications for scaling and filleting aside from the usual period of minor adjustments in the technique used by the workers. In certain steps in the process, such as the scaling of the fish, there may actually be an advantage in favor of the round-frozen fish.

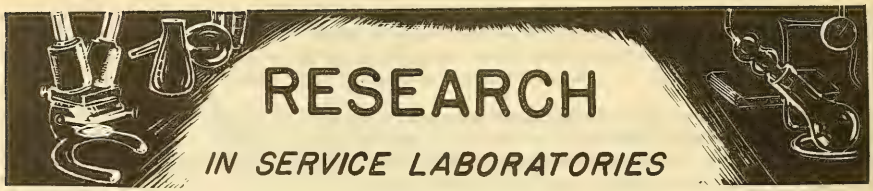
2. The yield of fillets obtained from the round brine-frozen fish was at least comparatively as high as that from control lots of iced, dressed fish.

3. The appearance of the fillets from brine-frozen haddock was in all instances comparable with that of good-quality fillets from iced fish.

4. No new problems are posed in the filleting, packaging, and freezing of fillets from round brine-frozen water-thawed fish. It is, however, recommended that, based on sound fish-handling practices which are as applicable to the thawed as to iced fish, the filleting, packaging, and refreezing process be carried out within a short time after the fish have been thawed.

5. Filleting the whole fish (containing the viscera) rather than the dressed fish apparently posed no problems during the filleting operation.

6. The appearance, flavor, odor, and texture of the fillets from round brine-frozen fish, thawed in fresh water held at 53° F. or 72° F., are quite acceptable.



January 1952

COMPOSITION: Composition and Cold-Storage Life of Fresh Water Fish: Data on the composition of ten additional samples of yellow pike are presented in the following table. (Data on the first six samples of yellow pike were presented in the Commercial Fisheries Review, December 1951, vol. 13, no. 12, p. 14.)

Composition of the Edible Portion of Yellow Pike

Sample Number	Length of Fish	Weight of Fish	Fillet Yield	Moisture	Fat	Protein	Ash
	Centimeters	Grams	Percent	Percent	Percent	Percent	Percent
7	41	555	59.0	80.4	0.80	19.0	1.26
8	39	505	53.5	79.5	1.42	19.5	1.17
9	39	492	60.0	80.4	0.84	19.0	1.18
10	42	685	59.0	80.5	1.14	18.7	1.12
11	36	425	57.0	80.6	0.80	19.4	1.31
12	43	845	56.0	80.0	1.16	19.0	1.20
13	47	892	62.0	81.2	1.26	18.7	1.12
14	45.5	970	59.0	79.6	0.78	19.4	1.31
15	48	1100	60.0	80.1	1.28	19.0	1.20
16	52	1400	59.0	80.1	0.79	19.4	1.15

(Seattle).

* * * * *

Freezing Fish at Sea, Defrosting, Filleting, and Refreezing the Fillets: The refrigeration plant of the Service's experimental trawler Delaware was reconditioned and modified in accordance with findings from previous sea trials. The changes consisted of (1) installation of controls to permit regulation of the temperature of the brine in the brine freezer; (2) separation of the ammonia supply leading to the heat exchanger which cools the brine for the brine freezer and the exchanger which cools the coils supplying refrigeration to the fish hold (this allows individual control of the refrigeration for the brine freezer and the refrigerated hold, as necessary); and (3) changes in the coils of the refrigerated hold to permit more efficient flow of the alcohol-type refrigerated medium. A 24-hour test of the equipment, including the freezing of one charge of fish, indicated that the operational characteristics have been markedly improved and the possibility of rupture of the brine cooler tubes has been minimized.

(Boston).

* * * * *

TECHNICAL NOTE NO. 17--REFRACTIVE INDEX OF FREE OIL IN CANNED SALMON

INTRODUCTION

Data on the refractive index of free oil from cans of each of the five species of salmon are presented in this report. (Data were collected by a U. S. Fish and Wildlife Service laboratory.)

Harrison, Anderson, Pottinger, and Lee (1939) reported that essentially a straight-line relationship exists between the iodine numbers and refractive index values of oils from salmon waste. Their studies reported refractive index values of samples of salmon waste oil, but no samples of oil from cans of salmon were included. As an extension of their studies, the refractive index was determined on oils from samples of canned salmon. It was thought that establishment of the range of refractive index values for the different species of salmon might be of value as a means of identification of salmon in the can. A more certain method of identification can be made by examination of the scales, but this requires special knowledge possessed by very few persons. Furthermore, recently some salmon has been canned without the skin and in such cases no scales would be available for identification. Because of the probability that governmental standards for canned salmon will be set up in the not too distant future, it was thought, also, that publication of the refractive index values on these samples might be of interest.

In 1936 and in 1938 oil samples from 1,469 cans of salmon were examined for refractive index. The values, as reported by Fiedler (1941), are reprinted in table 1.

In 1939 additional refractive index values were obtained on 557 samples of oil from cans of salmon packed in 1938 (table 2)—these data have never been published elsewhere.

Table 1 - Refractive Index of Free Oil in Canned Salmon[1]

Species	Year of Pack	Number of Samples	Refractive Index		
			Range	Mean	Standard Deviation
Chinook or king	1936	109	1.4693-1.4743	1.47159	0.00101
	1938	77	1.4693-1.4753	1.47178	.00109
Red or sockeye	1936	275	1.4705-1.4768	1.47328	.00104
	1938	225	1.4710-1.4773	1.47475	.00116
Chum or keta	1936	104	1.4720-1.4766	1.47444	.00090
	1938	103	1.4734-1.4771	1.47489	.00068
Silver or coho	1936	125	1.4713-1.4787	1.47584	.00089
	1938	113	1.4744-1.4788	1.47665	.00074
Pink or humpback	1936	186	1.4707-1.4789	1.47634	.00126
	1938	152	1.4750-1.4796	1.47718	.00101

1/DATA IN THIS TABLE ARE REPRINTED FROM FIEDLER, R.H., FISHERY INDUSTRIES OF THE UNITED STATES, 1939, ADMINISTRATIVE REPORT NO. 41 (1941), P. 224.

PROCEDURE

Samples of oil were obtained in most cases by pouring the free oil and liquid into a graduated cylinder and pipeting the oil from the surface layer. Certain single cans of salmon did not contain sufficient free oil to readily recover an adequate sample, and in such cases the liquid contents from two or more cans were combined. The oil was filtered through cotton and the refractive index at 25° C. was determined using an Abbe refractometer.

In table 2 are listed the number of times each refractive index value was found for each of the five species of salmon. Values obtained on oil from more than one can of fish are listed separately with notation as to the number of cans of fish used to collect the sample. Tables 2 and 3 do not include data previously reported by Fiedler (1941).

Table 2 - Distribution of Refractive Index Values of Free Oil from Canned Salmon[1]

Refractive Index Values (25° C.)	Number of Times Refractive Index Value Occurred					Refractive Index Values (25° C.)	Number of Times Refractive Index Value Occurred				
	King or Chinook	Chum or Keta	Red or Sockeye	Coho or Silver	Pink		King or Chinook	Chum or Keta	Red or Sockeye	Coho or Silver	Pink
1.4700	3					1.4750		6; 3[a]; 14[c]	3	3; 1[c]	5
01	-					51		1[c]	-	-	1
02	1					52		5; 3[c]	1	2	3; 2[c]
03	-					53		3[c]	2	1	2; 2[c]
04	2					54		1; 1[c]	3[a]	4	3[c]
05	1					55		1[c]	1	3	1; 2[c]
06	1					56		-	-	2	5; 3[c]
07	1					57		1[c]	2[a]	2	1; 4[c]
08	1					58		1[c]	4; 1[b]	4	7; 5[c]
09	3					59		-	2	4; 1[c]	7; 6[c]
1.4710	3					1.4760		1	2	22; 1[a]; 2[c]	10; 5[c]
11	1					61		-	1	5	10; 3[c]
12	-					62		1	1	6	9; 1[c]
13	1					63		-	-	4	8; 1[c]
14	2					64		-	1	5	4; 2[c]
15	4					65		-	-	1	4; 2[c]
16	-					66		-	1	4	8; 1[c]
17	2					67		2	-	1	5; 2[c]
18	3					68		-	1	6	14; 5[c]
19	1					69		-	-	4; 1[a]; 1[b]	9; 1[c]
1.4720	5					1.4770				4	19; 4[c]
21	3					71				2	8; 1[c]
22	1					72				1	16; 2[c]
23	-					73				-	6
24	1					74				1	7
25	-					75				-	6
26	-					76				1	-
27	-					77				-	14
28	-					78				-	12
29	-					79				-	8
1.4730	-					1.4780					18
31	-					81					8
32	-					82					8
33	-					83					5
34	-					84					5
35	-	-				85					2
36	-	1[c]				86					3
37	-	-				87					1
38	-	-				88					4
39	1	-				89					1
1.4740	-	-	-	-	1	1.4790					3
41	-	1[c]	-	-	-	91					1
42	-	-	-	-	1	92					-
43	-	1[c]	1	-	-	93					-
44						94					1
45	-	1[a]	-	-	-	95					-
46	-	1; 1[a]	1	-	-	96					-
47	-	2[c]	1; 1[a]	-	-	97					1
48	-	1[a]; 3[c]	1[b]	1	-						
49	-	1[c]	1	2	-						

1/ VALUES IN THIS TABLE HAVE NEVER BEEN PUBLISHED BEFORE.
a INDICATES OIL SAMPLE OBTAINED BY COMPOSITING 2 CANS OF SALMON.
b INDICATES OIL SAMPLE OBTAINED BY COMPOSITING 3 CANS OF SALMON.
c INDICATES OIL SAMPLE OBTAINED BY COMPOSITING 12 CANS OF SALMON.
ALL OTHER FIGURES WITHOUT LETTERED SUFFIX ARE FOR OIL SAMPLES OBTAINED FROM SINGLE CANS OF SALMON.
- INDICATES NO DATA AND HAS BEEN INSERTED TO FACILITATE READING.

Table 3 - Summary of Refractive Index Values of Free Oil From Canned Salmon 1/

Species of Salmon	Number of Individual Cans Examined	Total Number of Samples Examined	Refractive Index at 25° C.		
			Range of Values	Average of Samples From Individual Cans	Weighted Average of Samples From All Cans
King or Chinook (Oncorhynchus tschawytscha)	41	41	1.4700 to 1.4739	1.47137	1.47137
Chum or Keta (O. keta)	17	57	1.4736 to 1.4767	1.47539	1.47500
Red or Sockeye (O. nerka)	24	32	1.4743 to 1.4768	1.47556	1.47475
Coho or Silver (O. kisutch)	95	98	1.4748 to 1.4776	1.47613	1.47602
Pink (O. gorbuscha)	272	329	1.4740 to 1.4797	1.47708	1.47640

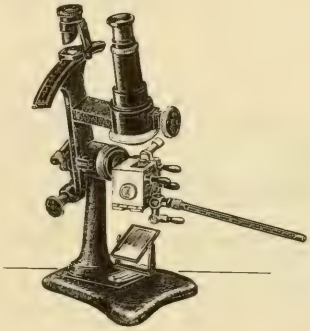
1/DATA IN THIS TABLE HAVE NEVER BEEN PUBLISHED BEFORE.

DISCUSSION OF DATA

King or chinook salmon is the only species for which there is a marked difference in refractive index from the other species. In this series, the refractive index of the oil from only 1 of the 41 samples of this species tested overlapped values for another species. Refractive index values of samples of all the other species showed extensive overlapping.

Table 3 shows the average and range of refractive index values for the five species of salmon. Average values for each species are presented separately: (1) for samples of oil taken from individual cans only and (2) for all samples.

In the latter case, the averages were calculated on a weighted basis; that is, a sample from 12 cans was weighted by a factor of 12, a sample from 3 cans by a factor of 3, etc.



REFRACTOMETER USED FOR DETERMINING REFRACTIVE INDEX OF FREE OIL IN CANNED SALMON.

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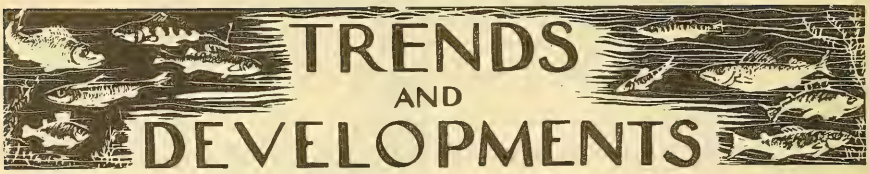
--By M. E. Stansby,
Chief, Pacific Coast and
Alaska Technological Research,
Fishery Technological Laboratory,
Branch of Commercial Fisheries,
Seattle, Washington.



Federal Purchases of Fishery Products

FRESH AND FROZEN FISH PURCHASES BY DEPARTMENT OF THE ARMY, DECEMBER 1951: A total of 2,225,362 pounds (valued at $1,160,779) of fresh and frozen fishery products were purchased by the Army Quartermaster Corps during December 1951 for the military feeding of the U. S. Army, Navy, Marine Corps, and Air Force (see table). In spite of the Christmas holidays, these fresh and frozen fish purchases were higher than in November by 25.5 percent in quantity and 19.5 percent in value. Compared with December 1950, the month's purchases were higher by 62.8 percent in quantity and 100.7 percent in value.

Purchases of Fresh and Frozen Fishery Products by Department of the Army (December and 12 Months 1950-51)

QUANTITY				VALUE			
December		January-December		December		January-December	
1951	1950	1951	1950	1951	1950	1951	1950
lbs.	lbs.	lbs.	lbs.	$	$	$	$
2,225,362	1,367,195	31,843,701	17,883,546	1,160,779	578,321	13,771,350	7,399,162

Purchases for the entire year 1951 totaled 31,843,701 pounds (valued at $13,771,350)--78.1 percent higher in quantity and 86.1 percent higher in value than the 17,883,546 pounds (valued at $7,399,162) reported in 1950. The 1949 purchases amounted to 17,473,642 pounds (valued at $5,862,011), and the 1948 purchases 14,058,349 pounds (valued at $4,327,431).

Food Product Specialist Examination

The Civil Service Commission on January 28 announced unassembled competitive examinations for the position of Food Product Specialist, grades GS-7 through GS-14. Extrance salaries range from $4,205 to $9,600 per year. No closing date has been specified.

The Chicago Quartermaster Depot, U. S. Army, requires Food Product Specialists for work in the fields of food research and development. Fish products is one of the many optional fields listed. These specialists will conduct, plan, or direct developmental investigations on foods suitable for the Armed Forces, on laboratory, pilot plant, or plant scale.

Applicants must have successfully completed a full four-year course in an accredited college or university (or in a non-accredited institution as described in the announcement), leading to a bachelor's degree in chemistry, chemical engineering, biochemistry, microbiology, physics, or food technology; or at least four years of successful and progressive technical scientific experience of such a nature as to insure successful performance at the professional level.

The following are types of experience which will be accepted in combination with education to complete the four-year requirement: (1) subprofessional and subsequent higher grade laboratory work, production, or manufacturing involving technical duties, and similar types of work which provide a means of obtaining a working knowledge of the theory and application of the scientific principles of food technology; (2) experience in patent examining or in abstracting, editing, or translating technical reports or scientific or technological literature; (3) research experience in fish products, including the analysis of data and the preparation of reports; and (4) technical work of professional grade.

To apply for this examination, file Form 57, College Transcript (or photostat, or a list of all college courses completed), Card Form 5001-ABC, and Form 15. The forms are obtainable from the Secretary, Board of U. S. Civil Service Examiners, at any first- or second-class post office; the Regional Director, Seventh U. S. Civil Service Region, New Post Office Building, Chicago 7, Illinois; or from the Board of U. S. Civil Service Examiners, Chicago Quartermaster Depot, 1819 West Pershing Road, Chicago 9, Illinois. Applications are to be sent to the Board of U. S. Civil Service Examiners, Chicago Quartermaster Depot, U. S. Army, 1819 West Pershing Road, Chicago 9, Illinois.

Gulf Fishery Investigations

SECOND PHASE OF OCEANOGRAPHIC STUDIES OF GULF OF MEXICO BEGUN BY M/V ALASKA (Cruise I-2): The initial cruise of the second coverage of the Gulf of Mexico to study currents, determine spawning areas of various fishes, and to resolve distribution pattern of fish larvae and juveniles was completed by the M/V Alaska on January 29, 1952. The sailing date was January 8 from Galveston, Texas. The vessel is operated by the Gulf Fishery Investigations under the Service's Branch of Fishery Biology, with the Department of Oceanography of Texas A. & M. College cooperating on physical oceanography. The investigations deal with the biological and oceanographic phases of the Gulf of Mexico's problems as a key to the productive potential of that body of water. The central, southeastern and mid-eastern Gulf of Mexico, including the Yucatan and Florida Straits, was the area covered on this cruise.

Stations were occupied, at depths ranging from 14 to 1,900 fathoms. Hydrographic casts and half-meter net plankton tows were made at each station. When conditions permitted, bottom samples were obtained from alternate stations. Extensive fouling of recording meters prevented the use of the continuous plankton sampler during most of the cruise.

Tows were made with a new high-speed plankton sampler while under way between stations. Tows were at an average depth of 25 feet during daylight hours and 10 feet at night. Samples thus obtained indicated plankton to be very sparsely distributed in the central Gulf. The presence of numerous post-larval and juvenile fishes in many of the samples gives every indication that the high-speed sampler will play an important role in future plankton collecting operations.

Trolling for pelagic fish with conventional feather and nylon jigs was carried out during daylight cruising. With the exception of seven large king mackerel (average weight 34 pounds, one being a 65-pound giant) taken in eight fathoms off the northeastern tip of Yucatan, and a like number of little tuna taken near Dry Tortugas, fish were conspicuously absent. Of note, however, was a 14½-inch specimen, tentatively identified as an Atlantic blackfin tuna, caught in the vicinity of Northern Shelves, Campeche Bank.

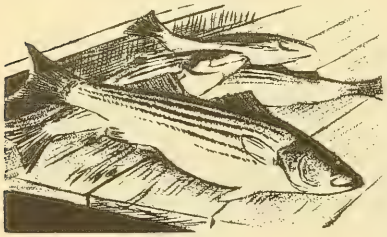
The presence of large numbers of Portuguese Men-of-War were observed throughout the cruise with great concentrations of this coelenterate in the southeastern and mid-eastern sections of the Gulf. Experienced Gulf fishermen aboard the Alaska stated that they had never seen such concentrations of the animal.

NOTE: ALSO SEE COMMERCIAL FISHERIES REVIEW, JUNE 1951, PP. 38-9.

Maryland Fisheries Production Increased from 1946 to 1950

"The Chesapeake Bay fisheries of Maryland appear to be in excellent condition judging from an analysis of the 1946-1950 catch records," a biologist of the Maryland Department of Research and Education at Solomons declared recently. "In fact, the total fisheries output for this period was 42.8 percent over the 1946 level."

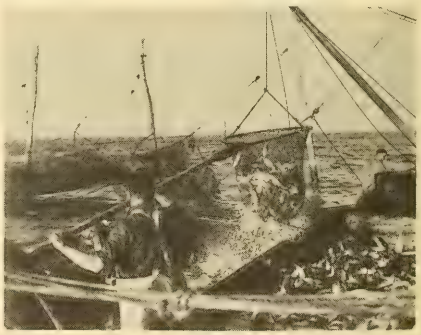
A compilation of most recent available data on the State's fishery resources shows that prices for fish were relatively stable, ranging from 9.7 to 9.0 cents per pound for all species during the five-year period.



STRIPED BASS

The biologist pointed out that most of the major fish species showed an upward trend in production. The total landings increased 4,929,929 pounds over the 1946 level. Two of the most commercially-important species demonstrated remarkable gains; striped bass or "rock" increased 94.6 percent over the 1946 level, while shad gained 101.2 percent. Alewives showed an increase of 69.5 percent, and white perch landings rose 74.3 percent. Although croakers suffered a slight recession, there was an overall increase of 3.5 percent above 1946. The only major species that failed to show stable or increased production was the gray sea trout. Catches of this species steadily dropped. resulting in a reduction of 84.4 percent.

"The outlook for the Atlantic Coast fisheries of Maryland is somewhat gloomy," stated the biologist. In contrast to the Bay landings, total production on the ocean side dropped from 6,343,675 pounds in 1946 and 7,016,307 pounds in 1947 to 4,193,283 pounds in 1950. This decline was due in some measure to marketing difficulties, but to a greater extent resulted from phenomenal decreases in certain individual species. Whiting, which reached a peak in 1947 of nearly 2,000,000 pounds, dropped to 6,700 pounds in the following year and made such a negligible contribution to the catch in 1949 and 1950 that no separate tabulation was made.



TAKING FISH FROM A POUND NET IN CHESAPEAKE BAY USING A DIP NET OPERATED BY THE POWER WINCH ABOARD VESSEL.

The production of gray sea trout from the coastal waters dropped half a million pounds during the five-year period covered by these statistics. Croaker landings dropped 300,000 pounds, and squirrel hake declined from nearly 370,000 pounds to less than 200 pounds. The declines in croakers and gray sea trout were reflected in both the trawl and pound-net catches. Since whiting and squirrel hake are more typically taken by trawls, the lower yields of these last two species resulted in a greater total reduction in the trawl fishery than in pound nets.

Wholesale and Retail Prices

WHOLESALE PRICES, DECEMBER 1951: Light supplies of fishery products in December 1951 (due to continued bad weather in many producing areas and curtailment of production during the Christmas holiday season) accounted for the higher prices which prevailed for these products during the month. Edible fishery products prices during that month rose 4.0 percent over November 1951 and 2.5 percent over December 1950. The edible fish and shellfish (fresh, frozen, and canned) wholesale index for December was 115.7 percent of the 1947 average (see table 1).

Table 1 - Wholesale Average Prices and Indexes of Fish and Shellfish, December 1951, with Comparative Data

Group, subgroup, and item; specification	Point of pricing	Unit	Average prices ($)			Indexes (1947 = 100)		
			Dec.1951	Nov.1951	Dec.1950	Dec.1951	Nov.1951	Dec.1950
ALL FISH AND SHELLFISH (Fresh, Frozen, and Canned)						115.7	111.2	112.9
Fresh and Frozen Fishery Products:						119.5	112.7	112.9
Drawn, Dressed, or whole Finfish:						136.0	126.9	130.2
Haddock, large, offshore, drawn, fresh	Boston	lb.	.17	.14	.14	172.5	145.3	142.4
Halibut, Western, 20/80 lbs., dressed, fresh or frozen	New York City	"	.33	.33	.40	95.6	96.6	115.3
Salmon, king, lge. & med., dressed, fresh or frozen	" " "	"	.54	.54	.55	132.5	132.9	134.4
Whitefish, mostly Lake Superior, drawn (dressed), fresh	Chicago	"	.45	.51	.51	130.6	145.9	146.0
Whitefish, mostly Lake Erie pound net, round, fresh	New York City	"	.56	.55	.61	126.6	123.5	137.9
Lake trout, domestic, mostly No. 1, drawn (dressed), fresh	Chicago	"	.63	.57	.50	138.4	125.2	109.8
Yellow pike, mostly Michigan (Lakes Michigan & Huron), round, fresh	New York City	"	.43	.49	.39	101.1	115.0	92.2
Processed, Fresh (Fish and Shellfish):						102.7	97.0	95.1
Fillets, haddock, small, skins on, 20-lb. tins	Boston	lb.	.44	.39	.28	157.7	140.1	99.9
Shrimp, lge. (26-30 count), headless, fresh or frozen	New York City	"	.51	.50	.55	74.1	72.0	79.7
Oysters, shucked, standards	Norfolk area	gal.	5.53	5.19	4.88	136.2	127.7	120.0
Processed, Frozen (Fish and Shellfish):						104.4	102.6	97.4
Fillets: Flounder (yellowtail), skinless, 10-lb. bxs.	Boston	lb.	.42	.42	.35	134.3	135.6	113.0
Haddock, small, 10-lb. cello-pack	"	"	.31	.29	.22	138.9	130.1	100.7
Ocean perch (rosefish), 10-lb. cello-pack	Gloucester	"	.26	.26	.26	130.0	130.0	131.9
Shrimp, lge. (26-30 count), 5-lb. bxs.	Chicago	"	.51	.50	.53	73.2	72.3	75.9
Canned Fishery Products:						109.8	109.0	112.9
Salmon, pink, No. 1 tall (16 oz.), 48 cans per case	Seattle	case	20.68	20.68	23.64	134.9	134.9	154.1
Tuna, light meat, solid pack, No. ½ tuna (7 oz.), 48 cans per case	Los Angeles	"	13.00	13.00	14.75	84.6	84.6	96.0
Sardines (pilchards), California, tomato pack, No. 1 oval (15 oz.), 48 cans per case	" "	"	8.59	7.20	6.25	96.0	80.5	69.9
Sardines, Maine, keyless oil, No. ¼ drawn (3¼ oz.), 100 cans per case	New York City	"	10.39	10.70	5.50	101.8	104.9	53.9

Haddock and other groundfish landings in December 1951 continued light. Fresh drawn large offshore haddock during the month jumped another 18.7 percent above the previous month and 21.1 percent above a year earlier. This increase was offset to a certain degree by lower prices for Western halibut and king salmon, both of which sold below November 1951 (by 1.0 and 0.3 percent, respectively)

and December 1950 (by 17.1 and 1.4 percent, respectively). Good supplies from Canada brought quotations for whitefish considerably below the previous year, while light supplies of lake trout and yellow pike accounted for price increases on these species. Drawn, dressed, or whole fin fish prices in December 1951 were 4.5 percent above the corresponding month in 1950 and 7.2 percent higher than in November 1951.

All processed fresh fish and shellfish items appearing in the index sold at prices considerably higher during December 1951 than the previous month. Compared with the same month in 1950, higher prices were reported for fresh haddock fillets (57.9 percent) and for shucked oysters (13.5 percent), while shrimp prices dropped 7.0 percent. Processed fresh fish and shellfish prices in general in December 1951 rose 8.0 percent above the same month a year earlier and 5.9 percent above the previous month.

The processed frozen fish and shellfish index for December 1951 rose 7.2 percent above the same month in 1950 and 1.8 percent above the previous month. From November to December, frozen flounder fillet prices dropped slightly and frozen ocean perch fillet prices remained unchanged but there was a substantial increase in frozen haddock fillet prices and a slight increase in frozen shrimp prices. As compared with the same month a year earlier, December 1951 prices declined 1.4 percent for ocean perch fillets and 3.6 percent for shrimp, but increased 18.8 percent for flounder fillets and 37.9 percent for haddock fillets.

Although the canned fishery products subgroup index continued to rise in December 1951 (0.7 percent above November 1951), it was entirely due to higher prices for canned California sardines. This season's California pack will be almost less than one-half of the 1950-51 pack of slightly over 5 million cases. Canned California sardine prices rose 19.3 percent from November to December 1951 and were 37.3 percent higher than in December 1950. During December 1951 some Maine packers reported sales of Maine sardines at prices somewhat below ceiling, which accounts for the drop of 3.0 percent for canned Maine sardines from November to December, but these prices are still 88.9 percent higher than in December 1950. Canned pink salmon and canned tuna prices did not change during December 1951, but compared with the same month in 1950 prices were lower by 12.5 percent for salmon and 11.9 percent for tuna. The canned fishery products index for December 1951 was 2.7 percent lower than for December 1950.

RETAIL PRICES, DECEMBER 1951: Slightly higher prices were paid by urban families of moderate income for all foods between mid-November and mid-December 1951, reports the Bureau of Labor Statistics of the Department of Labor. Although the adjusted retail price index for all fresh, frozen, and canned fish and shellfish in mid-December remained almost steady at 351.2 percent of the 1935-39 average, an increase in the fresh and frozen fish index was offset by a decline in the canned pink salmon index.

The retail index for all fish and shellfish in mid-December 1951 was 3.2 percent higher than during the same period a year earlier; for fresh and frozen fish 6.2 percent

higher. On the other hand, canned pink salmon in mid-December was 1.9 percent below the same month in 1950.

Table 2 - Adjusted Retail Price Indexes for Foods and Fishery Products, December 15, 1951, with Comparative Data

Item	Base	INDEXES		
		Dec.15,1951	Nov.15,1951	Dec.15,1950
All foods.....	1935-39 = 100	232.2	231.4	216.3
All fish and shellfish.... (fresh,frozen, and canned)	do	351.2	351.1	340.3
Fresh and frozen fish.....	1938-39 = 100	296.7	295.8	279.5
Canned salmon: pink.....	do	475.1	477.4	484.5

North Carolina and Mississippi School-Lunch Programs Use More Fish

Introduction: Nine million potential consumers of fishery products! That is a market the fishing industry cannot overlook. It is the approximate number of children eating lunches in school cafeterias in the United States.

How can the use of fish be increased in the lunchrooms of the nation's schools? One solution to the problem is the fish-cookery demonstrations conducted by the Branch of Commercial Fisheries of the U. S. Fish and Wildlife Service for school lunchroom managers. In the past three years the Branch's Educational and Market Development Section has conducted intensive demonstrational programs in a dozen states. As a result of these demonstrations more fish is being used in the schools.

FISH COOKERY DEMONSTRATION IN A NORTH CAROLINA SCHOOL, 1950.

North Carolina: The increase in the school's use of fish is determined by studies of their menus for comparative periods before and after the fish-cookery demonstrations. Such a survey has been completed in North Carolina. This survey was made to determine the results of 19 demonstrations presented there during the spring of 1950.1/

The results of the demonstrations in North Carolina were found to be excellent. To provide data for the survey, 154 schools represented at demonstrations were selected at random. In these schools, an 80-percent increase was found in the frequency that fish appeared in their lunch menus. An even greater increase, 94 percent, was found in the amount of fish that they had used.2/ This bigger

1/ IN MAKING THE SURVEY, FEBRUARY 1950 WAS TAKEN AS A REPRESENTATIVE MONTH BEFORE THE DEMONSTRATIONS, AND FEBRUARY 1951 WAS USED AS A REPRESENTATIVE MONTH AFTER THE DEMONSTRATIONS.

2/ THE POUNDS OF FISH USED BY A SCHOOL FOR THE PERIOD BEFORE AND AFTER THE DEMONSTRATIONS WAS CALCULATED BY MULTIPLYING THE AVERAGE NUMBER OF LUNCHES SERVED DAILY BY THE STANDARD 2-OUNCE LUNCH PORTION AND THEN BY THE NUMBER OF TIMES FISH WAS SERVED. THE RESULTING FIGURE IN OUNCES WAS THEN CONVERTED INTO POUNDS FOR USE IN TABLE 1.

percentage increase on a poundage basis was caused by the greater use of fish in the larger schools of the State.

To eliminate the possibility that the use of fish would have increased in North Carolina schools without the demonstrations, a survey was also made of 51 schools whose school-lunch personnel were not represented at the demonstrations. In these schools, which were otherwise comparable to those represented at the demonstrations, only a small increase in fish use was found. This increase amounted to nine percent in the frequency that fish was used, and 12 percent in the pounds of fish used. Therefore the net value of the demonstrations in North Carolina was an increase in the school use of fish of 71 percent in the frequency and 82 percent on a poundage basis.

Table 1 summarizes the findings of the survey in North Carolina. It can be seen that before the demonstrations the average school served fish only once per month, but that after the demonstrations they served fish 1.8 times per month.

Table 1 - Results of North Carolina School-Lunch Program Fish-Cookery Demonstrations

	Times Fish Were Used Per Month Per School			Average Amounts of Fish Used Per Month Per School		
	Demonstration		Percentage	Demonstration		Percentage
	Before	After	Change	Before	After	Change
	No.	No.	%	Lbs.	Lbs.	%
For Schools:						
Represented	1.0	1.8	+80	35.8	69.3	+ 94
Not represented	1.1	1.2	+ 9	29.5	33.1	+ 12
Net Gain by Represented Schools	0.1	0.6	+71	6.3	36.2	+ 82

The North Carolina schools surveyed were only a portion of the total schools represented at Service demonstrations in that State. Represented at the 19 demonstrations held during the spring of 1950 were 271 schools, feeding nearly 100,000 students. Ten demonstrations of fish cookery were also presented for North Carolina school-lunch managers in 1949.3/ Altogether the Service demonstrations in North Carolina have had representatives from nearly 500 schools. These schools, with an enrollment of nearly 300,000 children, have approximately 150,000 children eating lunches daily in their lunchrooms.

Since the schools represented at the North Carolina fish-cookery demonstrations were located in every section of the State, an interesting comparison was possible regarding the effectiveness of the demonstrations on a geographical basis. It has often been contended that inland areas are poor places to promote the sale of fish. Analysis of the North Carolina demonstrations directly refuted this belief.

Strange as it may seem, Western North Carolina schools increased their use of fish more than schools in Eastern North Carolina. In Eastern North Carolina (an area which is near the Atlantic Coast), schools before the demonstrations were using fish on an average of once per month, but after the demonstrations their use of fish increased to 1.7 times per month--a 70-percent increase. In Western North Carolina (which includes the mountainous area), schools increased the use of fish from once a month before the demonstrations to twice a month after the demonstrations--a 100 percent increase.

Mississippi: During the fall of 1950 a similar fish-cookery demonstration program was conducted in the State of Mississippi. Represented at the 22 demonstrations given were nearly 450 Mississippi school-lunch managers and supervisors.

3/ DETAILS OF THIS WORK WERE REPORTED IN COMMERCIAL FISHERIES REVIEW, SEPTEMBER 1950.

These schools, which have an enrollment of nearly 150,000 students, feed an average of over 80,000 students daily.

FILLETS READY FOR OVEN-FRYING; FISH COOKERY DEMONSTRATION, NORTH CAROLINA, 1950.

In Mississippi, as in North Carolina, the schools increased their use of fish as a result of the demonstrations. This result was determined by a survey made in a similar manner as the one in North Carolina. The use of fish in the schools before the demonstrations (January and February 1950) was compared to their use of fish after the demonstrations (January and February 1951). The survey indicated that a 36-percent increase had occurred in the frequency with which fish was used as a result of the demonstrations. Schools which had not been represented at a demonstration showed no increase in the frequency with which they were using fish. The number of pounds of fish used by the average Mississippi school represented at a demonstration increased 26 pounds per month.4/

Table 2 summarizes the results obtained from the Service's fish-cookery demonstrations in Mississippi.

Table 2 - Results of Mississippi School-Lunch Program Fish-Cookery Demonstrations

	Times Fish Were Used Per Month Per School			Average Amounts of Fish Used Per Month Per School		
	Demonstration		Percentage	Demonstration		Percentage
	Before	After	Change	Before	After	Change
	No.	No.	%	Lbs.	Lbs.	%
For Schools:						
Represented	2.5	3.4	+36	85.6	111.4	+30
Not Represented	2.3	2.3	0	49.8	52.0	+ 4
Net Gain by Represented Schools	0.2	1.1	+36	35.8	59.4	+26

Conclusions: The increase in the use of fish as a result of the demonstrations was greater in North Carolina on a percentage basis than in Mississippi. The reason for this is found in comparing the use of fish before the demonstrations in both States. Mississippi schools, since they were using more fish before the demonstrations naturally would not show such a large percentage gain but the gain in pounds of fish used was quite comparable. The worth of the demonstrations as a means of encouraging fish consumption, even where fish is already being used considerably, is shown by the results in Mississippi.

The success of fish-cookery demonstrations in North Carolina and Mississippi was due to several factors. It would not have been possible without the excellent cooperation which the Service received from the supervisors and staffs of the School-Lunch Programs in both States, and the Production and Marketing Administration of the U. S. Department of Agriculture.

4/ CALCULATION OF THE NUMBER OF POUNDS OF FISH USED WAS MADE IN THE SAME MANNER AS FOR THE NORTH CAROLINA SCHOOLS (SEE FOOTNOTE 2).

The receptiveness of the lunchroom personnel to information on fish cookery is another reason that the demonstrations were successful. Lunchroom cooks and managers WANT to learn how to cook fish by some other method than deep frying. They WANT to know about fish buying--what fish are available, where they can buy, and the cost. They WANT to know how to serve fish appetizingly so the children eating in the lunchrooms will like it. The reason they are so interested is simple -- they know fish is economical and nutritious. But to serve fish in their schools they need to know more than that. The fish-cookery demonstrations help them obtain the information needed to successfully use fish in school lunches.

Adequate delivery is one problem which the schools find is preventing them from using more fish. Dealers in fishery products, sometimes not realizing the amount of fish which schools will buy, often make little effort to sell fish to their local schools. The Service's marketing specialists in North Carolina and Mississippi were able, in many cases, to help work out solutions to this problem which enabled schools to obtain fish.

Although primarily for school-lunch personnel, the attendance at the demonstrations in both North Carolina and Mississippi included institutional cooks and dieticians, public-utility home economists, home-demonstration agents, and restaurant managers. As a result of seeing the Service fish-cookery demonstrations, the home economists of two Mississippi utility companies have begun using fishery products extensively in their demonstrations for homemakers. Many thousands of Mississippi homemakers are thus learning more about fish as an indirect result of the Service's work in the State.

NOTE: AS INDICATED IN THIS ARTICLE, THE GENERAL PROGRAM OF THE FISHERY EDUCATIONAL AND MARKET DEVELOPMENT SECTION OF THE SERVICE'S BRANCH OF COMMERCIAL FISHERIES HAS BEEN CONDUCTED IN OTHER STATES. FOR MORE INFORMATION ON THIS PROGRAM SEE COMMERCIAL FISHERIES REVIEW, APRIL 1951, PP. 32-6; SEPTEMBER 1950, PP. 23-6; JULY 1950, P. 17; APRIL 1950, PP. 49-51.

IN NORTH CAROLINA THE FIELD WORK ON WHICH THE ABOVE INFORMATION IS BASED WAS DONE BY ROBERT P. SEIFERT, FISHERY MARKETING SPECIALIST, AND THE DEMONSTRATIONS WERE MADE BY MISS JEAN BURTIS, HOME ECONOMIST, EDUCATIONAL AND MARKET DEVELOPMENT SECTION, BRANCH OF COMMERCIAL FISHERIES.

IN MISSISSIPPI THE FIELD WORK ON WHICH THE ABOVE INFORMATION IS BASED WAS DONE BY CLIFFORD B. LOWDEN, FISHERY MARKETING SPECIALIST, AND THE DEMONSTRATIONS WERE MADE BY MRS. DOROTHY ROBEY.

THE FOOD VALUE OF FISH AND SHELLFISH

Do you know . . .

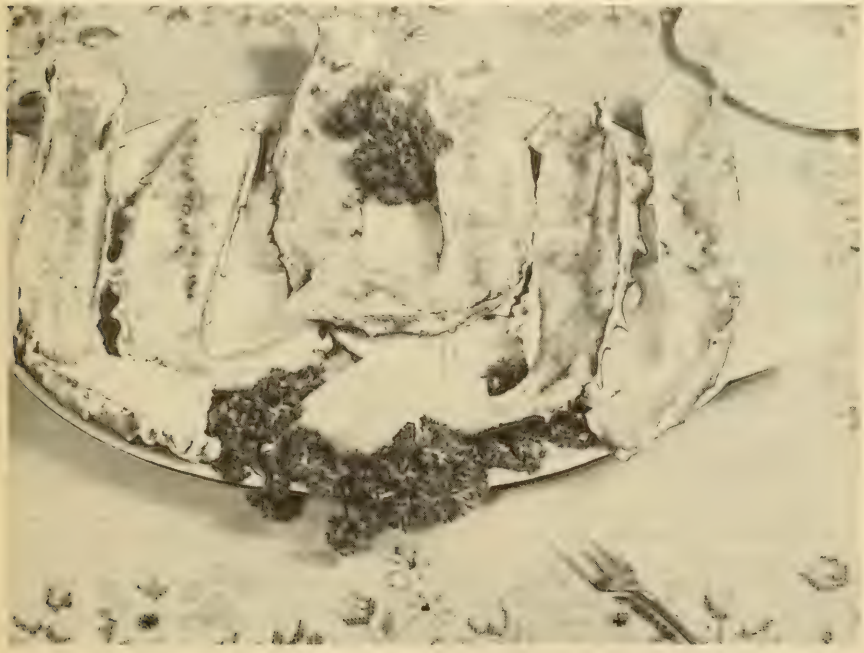
That numerous experiments have shown that the nutritive value of fishery products is equal or superior to that of the beef used for comparison . . .

KING CRAB RECIPES

The meat of king crab is white and sweet. It is composed of long, somewhat coarse fibers which, rather surprisingly, are tender. The edible portions of king crab consist almost entirely of large, firm leg sections, the outside surfaces of which are a beautiful bright coral color. These sections are so attractive that, when available whole, they should be used to provide eye-appeal for the finished dish. When accompanied by shredded meat, the leg sections may be reserved for use as a garnish.

WASHING FRESH-CAUGHT KING CRABS (PARALITHODES CAMTSCHATICA) ON THE DECK OF A FACTORY SHIP OPERATING IN THE BERING SEA.

King crab is a giant species of edible crab caught in the Bering Sea. On the prewar market it was commonly eaten by many people in this country as a canned product. In fact, the major portion of the canned crab eaten in the United States between 1935 and 1939 was king crab packed mainly by the Japanese. The meat of the king crab is newly available to the American consumer as frozen crab meat produced by American fishermen fishing off Alaska.



KING CRAB LEGS BROILED ON HALF SHELL.

Today's frozen king crab is first cooked and then the legs are frozen with the shell of the meat removed and frozen as blocks of solid meat. After freezing, the blocks are cut into 6-ounce cubes, wrapped, and packaged for retail distribution. The frozen king-crab meat is also available in non-standardized institution-size packages.

An advantage of the crab legs which are frozen with the shell is that these legs are so large they can be split and the meat broiled in the half-shell as is done with small lobster tails. It is also possible to remove the meat from the split shells, dice, combine it with other ingredients, and then return the filling to the brightly colored shells for reheating and serving.

Frozen king crab should be thawed in the refrigerator allowing four to six hours. After thawing, king-crab meat can be used in most crab-meat recipes. A few of the recipes recommended by the Fish and Wildlife Service follow:

King Crab Stew

2 6-OUNCE PACKAGES FROZEN KING-CRAB MEAT
1/2 CUP CRACKERS, FINELY CRUSHED
1 PINT CHICKEN STOCK
1 PINT MILK
1 PINT THIN CREAM
1/4 TEASPOON SALT
DASH CAYENNE
2 TABLESPOONS BUTTER OR MARGARINE

Thaw crab meat and remove any cartilage; chop. Combine crab meat and crackers. Add next 5 ingredients. Heat but do not boil. Add butter and serve immediately. Serves 6.

* * *

King Crab Newburg

2 6-OUNCE PACKAGES FROZEN KING-CRAB MEAT
3 TABLESPOONS BUTTER OR OTHER FAT
1-1/2 TABLESPOONS FLOUR
1/2 TEASPOON SALT
3/4 CUP CREAM
3 EGG YOLKS
3 TABLESPOONS SHERRY
TOAST CUPS, PATTY SHELLS, OR TOAST POINTS
PAPRIKA

Thaw crab meat and remove any cartilage; flake. Heat crab meat slowly in butter for about 5 minutes. Blend in flour and salt; add cream gradually and cook until thick, stirring constantly. Beat egg yolks and sherry together. Stir a little of the hot sauce into the egg mixture and add to remaining sauce, stirring constantly. Heat but do not boil. Serve in toast cups, patty shells, or on toast points. Garnish with paprika. Serves 6.

* * *

Molded King Crab Salad

2 6-OUNCE PACKAGES FROZEN KING-CRAB MEAT
1 CUP CELERY, CHOPPED
1/4 CUP FRENCH DRESSING
1 PACKAGE LEMON GELATIN
1-1/2 CUPS HOT WATER
1/2 CUP LEMON JUICE
1/2 TEASPOON SALT
SALAD GREENS
1/2 CUP MAYONNAISE OR SALAD DRESSING

Thaw crab meat and remove any cartilage. Marinate crab meat and celery in French dressing. Dissolve gelatin in hot water. Add lemon juice and salt. Place about 1/3 of the gelatin in a ring mold; chill until almost congealed. Arrange crab meat and celery attractively over the gelatin base and cover with remaining gelatin. Chill until firm. Unmold on round platter and garnish with salad greens. Fill center with mayonnaise. Serves 6.

Crab Meat Salad

2 6-OUNCE PACKAGES FROZEN KING-CRAB MEAT
1 CUP CELERY, CHOPPED
2 TABLESPOONS SWEET PICKLE, CHOPPED
2 TABLESPOONS ONION, CHOPPED
2 HARD-COOKED EGGS, CHOPPED
DASH PEPPER
1/2 TEASPOON SALT
1 CUP MAYONNAISE OR SALAD DRESSING
LETTUCE

Thaw crab meat and remove any cartilage. Combine all ingredients except lettuce; chill. Serve on lettuce and garnish. Serves 6.

* * *

King Crab Salad in Puff Shells

1 6-OUNCE PACKAGE FROZEN KING-CRAB MEAT
1/2 CUP CELERY, CHOPPED
1 TEASPOON LEMON JUICE
1 TEASPOON ONION, GRATED
1 TABLESPOON SWEET PICKLE, CHOPPED
1/4 TEASPOON CELERY SALT
1/2 TEASPOON SALT
DASH PEPPER
1/4 CUP MAYONNAISE OR SALAD DRESSING
36 SMALL PUFF SHELLS

Thaw crab meat and remove any cartilage; flake. Combine all ingredients except puff shells; chill. Cut the tops from puff shells and fill with the crab salad. Replace tops and garnish. Makes 36.

Puff Shells

1/2 CUP FLOUR
1/8 TEASPOON SALT
1/4 CUP BUTTER OR MARGARINE
1/2 CUP BOILING WATER
2 EGGS

Sift flour and measure. Add salt and sift again. Combine butter and boiling water in saucepan; place over low heat. When butter melts add flour all at one time and stir vigorously until mixture forms a ball and leaves the sides of the pan. Remove from heat. Add unbeaten eggs one at a time, beating thoroughly after each addition; continue beating until a thick dough is formed. Drop by teaspoonfuls onto a greased baking sheet. Bake in a hot oven, 400° F. for 20 to 30 minutes or until brown. Makes approximately 36 one-inch puff shells.

NOTE: ONE 6-OUNCE PACKAGE EQUALS APPROXIMATELY 1 CUP.

King Crab in Eggs

2 6-OUNCE PACKAGES FROZEN KING-CRAB MEAT
1 TABLESPOON CHILI SAUCE
1 TEASPOON PIMIENTO, CHOPPED
1 TEASPOON GREEN PEPPER, CHOPPED
1 TEASPOON ONION, GRATED
1 CUP MAYONNAISE OR SALAD DRESSING
1 DOZEN HARD-COOKED EGGS
5 TOMATOES
1 HEAD LETTUCE
PARSLEY

Thaw crab meat and remove any cartilage; flake. Add seasonings and mayonnaise. Chill. Cut eggs in half lengthwise and remove yolks. Fill egg whites with crab mixture and serve on tomato slices on a bed of lettuce. Garnish with grated egg yolk and sprigs of parsley. Makes 24 stuffed eggs.

King Crab Broiled on the Half Shell

5 POUNDS FROZEN KING-CRAB LEGS
1/4 CUP BUTTER OR MARGARINE, MELTED
2 TABLESPOONS LEMON JUICE
1 TEASPOON GRATED ONION
1/2 TEASPOON SALT
DASH PEPPER
PAPRIKA

Split the crab legs in two lengthwise while still frozen. Combine the next 5 ingredients and mix well. Sprinkle or brush mixture over cut surfaces and place crab legs in preheated broiler about 2 inches from the source of heat. Broil for 10 minutes or until heated through and slightly browned on the surface. Garnish with paprika. Serves 6.

--By Kathryn Osterhaug, Home Economist,
Educational and Market Development Section,
Branch of Commercial Fisheries,
U. S. Fish and Wildlife Service,
Seattle, Washington

Fishery Products Marketing Outlook for 1952 and Review for 1951

Prospects for 1952: Little change in the level of consumption of all fishery products is expected for 1952 in the United States. Cold storage stocks of fish and shellfish at the beginning of the year were record-large in size for that date, and probably will be adequate for anticipated domestic needs until spring, when commercial production expands seasonally. On the other hand, as a result of several reduced 1951 packs, canned fish supplies are expected to be lower than a year earlier, at least until the 1952 packs start moving to market in volume after mid-year. Retail prices of fishery products probably will not change much from the 1951 level, particularly if meat supplies are no larger than are currently anticipated.

The United States foreign trade in fishery products is likely to follow the pattern of the past few years. Imports, especially of frozen fish fillets, are expected to continue large. Exports, on the other hand, may be somewhat smaller than in 1951.

Review of 1951: U. S. civilian per-capita consumption of fishery products in 1951 continued at practically the same rate (almost 11.5 pounds, edible weight) as in the preceding 3 years. The commercial catch of edible fish and shellfish was more than 10 percent smaller than in 1950, with the decline occurring principally in the fish used for canning, but consumption was maintained by drawing on the stocks of major canned items carried over from the very large 1950 packs.

The commercial catch of edible fishery products for sale in the fresh and frozen form was somewhat larger than in 1950. Commercial freezings of all fish and shellfish in the United States and Alaska totaled 325.5 million pounds, more than 13.3 percent greater than in the preceding year. Cold-storage stocks of all fresh and frozen fishery commodities at the end of 1951 amounted to 168.8 million pounds--11 million pounds more than a year earlier and the largest on record for that date. Retail prices of fresh and frozen fishery commodities in 1951 averaged 7 percent above a year earlier.

Production of canned fishery products in 1951 was about one-fifth smaller than in the preceding year. The pack of canned salmon was up 7 percent, mainly due to a larger pack of pink salmon. On the other hand, the pack of tuna was more than 5 percent below the record 1950 output, and the packs of canned California and Maine sardines were down more than 45 percent and 60 percent, respectively. The lower output of canned tuna was directly attributable to the packers' response to market demand. Although still good, the demand for canned tuna apparently was not good enough to absorb the relatively large domestic and imported supplies without some decline in prices from the level which prevailed during the latter part of 1950. The small packs of both California and Maine sardines resulted entirely from poor catches.

Military purchases of fishery products were much larger than in 1950, with most of the increase in fresh and frozen commodities. Procurement of fresh and frozen products in 1951, although still a relatively small part of the total supply, was about 70 percent larger than a year earlier; canned fish procurement was about 15 percent greater. Purchases of fresh and frozen fishery products during the third and early part of the fourth quarter of the year was especially large because the military agencies found it difficult to carry out their purchase program for meat and, as a result, bought additional quantities of fishery products as an alternative protein food.

Imports of frozen groundfish (cod, haddock, hake, pollock, cusk and ocean perch) fillets (one of the most important import items among fishery products) totaled 87.0 million pounds in 1951, about 31 percent greater than a year earlier. Exports of canned fishery products from the United States were much larger than in 1950.

This analysis appeared in a report prepared by the Bureau of Agricultural Economics, U. S. Department of Agriculture, in cooperation with the U. S. Fish and Wildlife Service, and published in the former agency's January-March 1952 issue of The National Food Situation.

FREEZING AND CANNING KING CRAB

The techniques used in the preparation and handling of king crab are of primary importance in maintaining the quality of the canned or frozen product. King-crab meat must be processed with utmost care to insure the maximum retention of color, flavor, and texture. A high quality product can be obtained only if careful attention is given to initial phases of handling the king crab, such as holding the live crab, butchering, cooking, cooling, removing the meat, and cleaning. Recommendations are based on observations of experimental and commercial packs.

Additional factors pertaining to packaging of meat for freezing and to heat processing are discussed in "Freezing and Canning King Crab."

--Fishery Leaflet 374

FOREIGN

Brazil

DANISH CUTTERS TO FISH OUT OF BRAZILIAN PORT: A large private freezing and canning firm in Brazil has contracted for four Danish cutters to fish out of Rio Grande do Sul, according to the November 22 issue of Fiskets Gang, a Norwegian trade paper. Unless two which have been fishing out of Montevideo, Uruguay, for the last 2½ years are used, all four of the cutters will come from Denmark.

The cutters will fish under the Danish flag and with a Danish crew. In conformance with the terms of the two-year contract, the catch will be sold at the going price rather than at fixed prices as was the case in Uruguay.

British Honduras

SPINY LOBSTER SEASON IN FULL SWING: The spiny lobster season in British Honduras opened on July 15, reports an American consular dispatch from that country. The closed season for spiny lobsters began on March 15, 1951, and ended with the opening of the new fishing season.

Reports indicate that there has been a large demand for spiny lobsters from the United States and neighboring republics. Two freezing plants have recently been established in Belize, and one American fishing vessel has been anchored at Glover Reef in the Belize harbor for the processing of spiny lobsters (crayfish) for the export market.

Canada

U. S. CAPITAL DEVELOPING CANADIAN ATLANTIC FISHERIES: An influx of United States private capital in the development of the Canadian Atlantic fishing industry is reported, according to a November dispatch from the American consulate office in Canada.

A United States company and a Canadian company are jointly participating in the installation and development of a cold-storage and fish-meal plant at Louisburg, Nova Scotia, which will cost approximately C$4,000,000. In addition, the United States company on its own is making an investment there of approximately C$1,000,000 to include two draggers and a fish-processing plant.

A similar development at Petit de Grat, Nova Scotia, includes installations for a fish plant and dragger base at an investment of almost C$1,000,000.

* * * * *

DANISH TRAWL ON TRIAL IN BRITISH COLUMBIA: A license for the operation of a Danish-type floating trawl net has been issued by the Canadian Department of Fisheries to a Victoria, B. C., fisherman, according to the December 1951 Trade News. This type of gear, fairly common in North Atlantic fisheries, is on trial in the Pacific area and this season's operations for the catching of herring will be closely watched by an observer from the Pacific Biological Station of the Fisheries Research Board of Canada, who will be aboard during the fishing.

The Danish trawl net is towed by two vessels, which may operate as much as 300 feet apart. Instead of being dragged along the floor of the sea, as with an ordinary otter trawl, the Danish-type net is set at any depth in which fish may be swimming. It consists of four lead wings and the usual cod ends; a bridle line from the outer wings leading to the towing ships. A line of corks keeps the topside of the net buoyant and a heavy footrope insures an open lead while in motion. Heavy iron weights are carried on the bridle lines, and adjustment of these permits changes in the depth at which the trawl is operated.

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BRITISH COLUMBIA HERRING FISHERY: During the 1951-52 season, the British Columbia herring fleet did not leave for the fishing grounds until November 15, 1951--a delay of 24 hours resulting from a price dispute with the packers, states a January 3 American consular dispatch from Vancouver. The fleet consists of about 125 small seiners.

The new price agreement provides for a price increase of 11 cents per metric ton over the price paid last year or an increase of 14 percent over last year's price of $7.40 a ton.

Chile

"FISH WEEK" CELEBRATED IN SANTIAGO: The rich fisheries off the Chilean coast contribute little at present to the country's food supplies. Therefore, an FAO fisheries mission is advising increased exploitation, especially of hake (a species which is found abundantly in Chilean waters), according to a January 1952 news release from the North American Regional Office of the Food and Agriculture Organization.

Part of the scheme demands popularization of fish among people not at present accustomed to eating it, and an exhibition was organized with FAO assistance the last week in November in Santiago. An open air installation on the Santa Lucia Hill included stands displaying fish and fish products, and education stands. Fisheries films were shown, as well as exhibits from the Museum of the Chilean Fish and Wild Life Service.

In the restaurant, more than 3,000 people ate fried fish daily and the daily visitors numbered between 20,000-30,000. It is not difficult to popularize fish eating among coastal peoples who are already accustomed to eating dried fish, which can be obtained locally at a low price, but the Ministry of Education is carrying its campaign inland, by organizing competitions in the schools for drawings of fish and essays on the importance of fish in a balanced diet.

Dominican Republic

FISHERIES PRODUCTION AND CONSUMPTION INCREASING: Despite numerous attempts to develop a domestic deep-sea fishing industry, the Dominican Republic remains dependent upon foreign sources for most of its fish requirements, a November 14 American consular report from Ciudad Trujillo states.

Domestic fishermen supply small quantities of tropical fish and crustaceans for the local market. The bulk of sea food consumed in the Dominican Republic consists of salted, dried, or smoked fish brought in from Canada, the United States, and European fisheries. Fish are extremely expensive in the Dominican Republic, and this factor places important limitations upon domestic consumption of this important food commodity. It is expected that efforts to develop a domestic fishing industry will continue

An estimated 650 metric tons of fish were produced in the Dominican Republic in 1951, compared to 632 tons in 1950 and 332 tons in 1939.

Imports of fresh and preserved fish amounted to 3,756 tons in 1950 and 2,865 tons in 1949, compared with the prewar annual average of 1,861 tons.

The per-capita consumption of fish in 1950 amounted to 4.4 pounds as compared with a prewar average of 3.1 pounds. Apparent total consumption of fishery products in 1950 was 4,388 tons.

Formosa

FISHERY EXPANSION PLANNED BY GOVERNMENT: In order to carry out enlarged programs involving the building of new fishing boats and the procurement of fishing nets and tackle, the Provincial Agriculture Department reports that its fishery section will be enlarged to a Fishery Administration.

The private fishing industry is suffering from a shortage of operational funds because of inadequate Government loans, a shortage of fishing nets (particularly cotton yarn for making fishing nets), and the insurance companies' reluctance to insure the fishermen, points out a November 21 American dispatch from Taipei.

India

DEEP-SEA FISHING IN BENGAL WATERS: Under the guidance of Japanese experts, the West Bengal Government proposes to train Indians in deep-sea fishing, according to a December 5 American consular dispatch from Calcutta. The Director of Fisheries of the State Government will proceed to Japan to examine the possibilities of securing the services of experts and acquiring equipment.

The new plan of bringing in Japanese experts, a year after the deep-sea fishing scheme was inaugurated with the aid of Danish technical personnel and craft, has evidently given rise to some criticism. However, this new step has been taken not because the present experiment with the Danish vessels and crew has proved a failure, but because the experience gained so far holds out a promising prospect and indicates the need for expanding and expediting the present investigations and program with the help of additional equipment and larger facilities for training local recruits, according to Government sources.

It is claimed by the West Bengal Government that the Danish trawlers made 15 trips in ten months, with the main object of collecting all relevant information about the possibilities of marine fishing on a commercial scale in the Bay of Bengal. Valuable data have been collected--types of fish and their location, and the kind of nets and other equipment which will be suitable. Most important of all, says the West Bengal Government young recruits are learning the work and living the life of seafaring fishermen.

The proposal to send the Fisheries Director to Japan is aimed at quickening the pace and expanding the scope of the exploratory work which has been started, and is the outcome of an offer received through the Government of India some time ago from the Fisheries Research Institute of Tokyo, for investigating possibilities of marine fishing in the Bay of Bengal with the help of Japanese personnel and vessels. It was decided that the State's Fisheries Directorate should determine the range of facilities available and make recommendations, and the Fisheries Director accordingly has been deputed to Japan. This is a part of the Government's efforts to augment an important source of food supply.

A year ago an Indian expert stated that the methods practised in Japan and China were likely to be more fruitful than those of Europe or America. Public opinion did not unanimously favor the Danish fishing techniques.

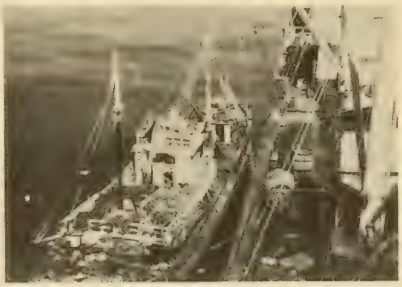
Italy

IMPORT DUTIES ON COD SUSPENDED: By the same decree which reduces tariff rates by one-tenth, the Italian Government suspended import duties on a number of foodstuffs affecting the Italian cost of living, including cod and similar fish, points out an American consular dispatch from that country.

Among a number of economic measures taken to correct its exaggerated surplus position in the European Payments Union, the Italian Government decreed a temporary reduction by one-tenth on effective customs duties for all products except 70 tariff items (Presidential decree No. 1125 of November 1, 1951, published in the Gazette Officiale of November 3, 1951).

Japan

SUMMARY OF NINE MOTHERSHIP-TYPE TUNA EXPEDITIONS: Nine mothership-type tuna expeditions to the waters adjacent to the Trust Territory Pacific Islands were completed by the Japanese, states an October 31 Weekly Summary of SCAP's Natural Resources Section. The first of these expeditions left Japan on June 8, 1950, and the last expedition returned to Japan on November 3, 1951. The Japanese long-line fishing system was used since this is the only method which appears to be successful in this area.



A CATCHER BOAT TIED UP TO A MOTHERSHIP.

The expeditions operated in the area bounded generally by 1°-6° N. latitude and 137°-175° E. longitude. A representative of the Supreme Commander for the Allied Powers accompanied each expedition. An observer from the Office of the High Commissioner, Trust Territory Pacific Islands, also accompanied the expeditions, collecting biological and scientific data for the Pacific Oceanic Fisheries Investigations Office of the United States Fish and Wildlife Service, Department of Interior, Honolulu, Hawaii. No violation of directives of the Supreme Commander or the fishing and navigation instructions of the High Commissioner occurred during the nine expeditions.

Table 1 - Summary of Production of Nine Japanese Tuna Expeditions

Expedition No.	Yellowfin	Other Tunas	Swordfish	Sharks	Other Fish	Total
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	4,572,698	774,510	1,850,945	894,698	23,045	8,115,896
2	3,246,486	421,136	1,469,812	402,518	37,970	5,577,922
3	395,889	67,541	85,104	37,025	4,095	589,654
4	805,609	149,495	314,263	28,917	12,234	1,310,518
5	2,362,708	1,931,292	54,539	24,810	2,000	4,375,349
6	710,739	162,026	228,449	41,746	16,604	1,159,564
7	3,857,304	2,368,871	2,149,060	802,289	51,760	9,229,284
8 1/	3,090,500	1,700,000	1,622,500	1,236,000	77,200	7,726,200
9 1/	148,900	87,000	115,800	9,800	14,900	376,400
Total	19,190,833	7,661,871	7,890,472	3,477,803	239,808	38,460,787

1/ESTIMATED.

The quality of approximately 45 percent of the products of the nine expeditions were designated Class A fish; 30 percent as Class B; 11 percent, Class C; and 14 percent, Class D. All grades of fish were edible, except a portion of Class D which was used as fertilizer.

It was estimated that as much as 35 percent of the catch would be suitable for export before the first expedition departed; however, several small expeditions were dispatched using motherships not equipped with adequate freezing facilities and the percentage of exportable fish was reduced. The only product of the nine expeditions exported to the United States was the yellowfin tuna. Proceeds from this export were estimated at more than US$800,000.

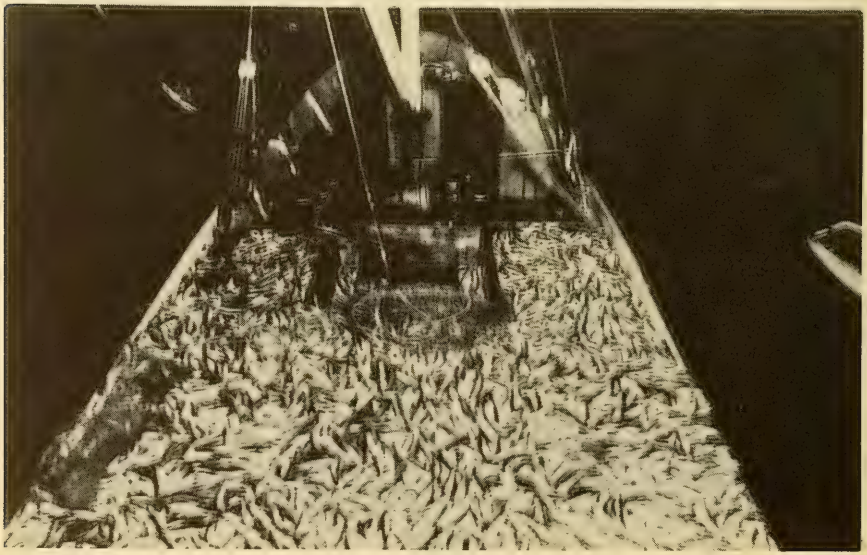
Table 2 - Amount and Percentage of Yellowfin Tuna Caught By Japanese Mothership-Type Tuna Expeditions Exported to United States

Expedition No.	Total Catch (All Species)	Yellowfin Exported to U.S.	Percent of Total Catch (All Species)
	lbs.	lbs.	%
1	8,115,896	3,895,630	48
2	5,577,922	1,673,376	30
3	589,654	0	0
4	1,310,518	26,210	2
5	4,375,349	1,662,633	38
6	1,159,564	81,169	7
7	9,229,284	0	0
8	7,726,200	772,620	10
9	376,400	0	0
Total ...	38,460,787	8,111,638	21

No other expeditions departed for the Trust Territory Pacific Islands after November 3, 1951, for the balance of 1951.

Norway

1951 FISHERIES PRODUCTION SETS NEW RECORD: The fisheries of Norway set a new production record in 1951 with a yield of 1,646,005 metric tons, according to preliminary figures in the December 27 issue of Fiskets Gang, a Norwegian Government fishery publication. The total is 25 percent or 328,194 tons greater than



A NORWEGIAN HERRING VESSEL BOUND FOR PORT WITH AS MUCH HERRING AS IT CAN CARRY.

in the former record year of 1948, and 367,337 tons larger than in 1950. The increase was due to a record catch of winter herring, larger catches of small and fat herring, and good catches of spawning cod.

The winter herring fishery produced a record 888,006 tons. The expanded purse-seine fishery for spawning cod off Lofoten caught 147,799,000 pounds (67,041 tons) of cod with 507 seines. Records were also set in the mackerel fishery with 40,036,000 pounds (18,160 tons) caught and in the new tuna fishery with a catch of 11,113,00 pounds (5,041 tons).

The record catch also set a new record for value to the fishermen. The total value was 474,822,000 kroner (US$66,475,000), compared with 346,039,000 kroner (US$48,445,000) in 1950. The average price for gutted spawning cod was 50.7 øre per kilo (3.2 US cents per pound) and for winter herring 15.14 kroner per hectoliter of 93 kilos (US$22.80 per metric ton). The record catch resulted in a record financial return from fisheries exports.

It appears that the most important Norwegian fisheries are in a relatively good period. The resources of winter herring are such that they can form the basis for an equally large catch in 1952. The stock of spawning cod also is favorable. But the fat and small herring fisheries are variable. In the case of herring, the market conditions have a direct influence on the volume of the catch.

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FISH CANNING TRENDS: Norwegian autumn (1951) fishing of summer sild suitable for canning purposes met with little or no success and factories received only occasional deliveries from the fishing fleet, reports a January 2 American Embassy dispatch from Oslo.

The crab pack, also nearing completion towards the latter part of December 1951 was reported abnormally small.

Fish canners are perturbed about the prospects of intensified British import regulations against canned fish and continued difficulties in obtaining tin plating and packing material.

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SARDINE PACK, 1951: A total of 450,000 cases of brisling were packed in Norway during 1951, according to preliminary estimates reported by the American consulates in Norway on November 23. This was somewhat less than the average yearly pack of 500,000 cases. On the other hand, 560,000 cases of sild sardines were canned as compared to a normal pack of some 500,000 cases.

FISH MEAL INDUSTRY EXPANDS: Norwegian herring meal factories are expected to reach a production capacity of between 300,000 to 350,000 hectoliters (27,000-31,500 metric tons) per 24-hour day. The herring-meal industry's consumption of herring has expanded considerably from year to year. In 1950, 6,714,000 hectoliters (604,260 tons) representing 82.26 per cent of the catch were used, as compared to 7,550,870 hectoliters (679,578 tons) or 79 percent of the catch in 1951. Warehouse capacity in this industry has also increased. In 1950 it was given as 3,424,000 hectoliters (308,160 tons), as compared to 4,302,000 hectoliters (387,180 tons) in 1951.

The herring meal stockpile in Norway, with the exception of a very small quantity in the Haugesund district, is reported to have been exhausted as of mid-November

1951. Up until October 1, 1951, the export of this item reached 104,515 metric tons.

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STICKWATER UTILIZATION METHOD DEVELOPED IN HERRING MEAL PRODUCTION: A method of utilizing all stickwater in the production of herring meal has been developed by the Norwegian Herring Oil and Herring Meal Industry's Research Institute, states a January 9 American consular report from Bergen. The technical problem of utilizing stickwater in the herring meal industry has now been solved, thereby increasing production by one-fifth without using more raw material.

The method consists of mixing concentrated stickwater (solubles) into the press cake, and then drying it (using a heating process for this operation). This method gives no technical difficulties, and the meal produced last summer, after four months' storage, is as fine in quality as the day it was stored. A special method of packing has also been tested, using impregnated thick paper sacks which keep out moisture. This has been tried because whole meal draws water more easily than the usual herring-meal types.

Several factories will use the new method this winter. It is estimated that, using the new method besides the three other methods which are in use for utilization of stickwater, approximately 10 percent of the total herring-meal production this winter will be whole meal.

Machinery for a factory with a capacity of approximately 5,000 hectoliters (463 metric tons) of herring per 24-hour day would need machinery valued at between 400,000 and 600,000 kroner (US$55,900 and US$84,000) for the new method. After all the factories (which now make whole meal) have gained sufficient experience through this winter's operations and provided the results are good, more factories will undoubtedly take up this production. But even if results are as good as hoped, several years will pass before all 70 factories in Norway will be able to fully utilize the stickwater, as it will be difficult to obtain a sufficient number of machines.

If all factories start to utilize stickwater using the method which the Research Institute has investigated, they will have possibilities of bringing to market three different first-class herring products: herring meal; fish solubles; and whole meal.

Norwegian factories for quite some time have desired to utilize stickwater, as they realized that rich nutritive materials were being thrown away with the stickwater and, therefore, attempts have been made throughout a long period to find methods of utilizing it. During the last winter season, approximately 150,000 metric tons of herring meal were produced at the 70 factories in Norway. It is estimated that one-fifth of the nutritive value of the herring used to produce the 150,000 tons of meal were thrown away with the stickwater; i.e., it would have been possible to produce 30,000 metric tons more herring meal from the same quantity of herring last winter if it had been possible to utilize the stickwater 100 percent.

Using usual winter herring, it is estimated that between 5.6 to 5.8 hectoliters (1,000 to 1,200 pounds) of herring is used to produce 220 pounds of herring meal. By using the new method, the amount of herring used to produce the same quantity of meal will be brought down to 4.5 to 4.6 hectoliters (920 to 940 pounds). It is also estimated that this meal is more nutritious. According to estimates, this meal contains more vitamins, but how well these vitamins keep under production of the meal is still being investigated. With respect to the price on this

whole meal, it may be stated that the Norwegian Price Directorate has fixed the price, stipulating an additional six kroner ($0.84) for this whole meal per 100 kilos (220 pounds).

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SCENTED PEARLS FROM HERRING SCALES: Glistening pearls made from herring scales, which will develop an alluring scent in a month or two, have been invented in Norway, states the Norwegian Information Service in a January 24 news release. Impervious even to boiling lye, they sell for less than any other foreign make of artificial pearls, and are every bit as attractive. At the present time, available only in a sort of light ivory shade, the herring pearls will later be made in every conceivable color and scent.

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FROZEN FISH PUDDING--A NEW EXPORT PRODUCT: Five tons of quick-frozen fish pudding, a new export product of Norway, have been shipped to European markets from Honefoss, according to a January 24 release from the Norwegian Information Service. The next shipment is scheduled for export to the United States.

Pakistan

FISHERIES EXPANSION PLANNED: The rich fisheries of the Indian Ocean are only now beginning to be exploited, according to a December 1951 news release from the North American Regional Office of the Food and Agriculture Organization. The Government of Pakistan has taken the first steps toward larger catches and making fish available for the population, by drawing up plans for a new fish harbor at Karachi, with modern warehouses and ice plants to handle the catch.

The new harbor has been designed by two FAO experts from the Netherlands. The harbor is to be laid out on the east side of the present harbor entrance. The present harbor is situated inside the channel along which are wharves and moorings for merchant vessels, necessitating a journey of about five sea miles from the open sea which may take 3 to 4 hours each way. Since most fishing boats have only sail, they must often tack against ordinary winds, at the same time, avoiding merchant shipping, while the fish caught are unprotected from the tropical sun.

Work will commence on the new harbor early in 1952, and will include a model fishing village laid out on reclaimed land nearby. It will probably be completed in 1953-4.

Local fishermen will be aided not only by a better harbor, but by the mechanization of fishing craft which the Government will undertake. The FAO experts have recommended that Diesel-powered boats of about 33 gross metric tons should form the nucleus of the fleet. Even with present craft, large catches are made without difficulty, and it is certain that with modern methods and good port and handling facilities, a large supply of fresh fish can be obtained not only for the inhabitants of Karachi, but for those in the interior. Processed and dried fish will be made available over the whole of West Pakistan and may be exported to regions such as Afghanistan, where fish is at present unknown.

Thailand

FAMILY PREPARING FISH FOR DRYING AT NARATHIWAT, SOUTHERN REGION, THAILAND.

FISHERIES DEVELOPMENT NEEDED: There is a strong demand for canned and dried fish in Thailand and neighboring countries. Present limited shallow-water fishing and a single Government-owned fish cannery supply only a part of the demand for these products.

A recent study indicates the need for the development of the following: (1) a deep-sea fishing fleet; (2) cold-storage and ice plants; (3) preservation (canning or drying) plants; (4) a shark-liver oil processing plant; and a non-edible fish waste processing plant for producing fertilizers.

Mother-of-pearl fisheries and processing could also be developed along the Indian Ocean coast, and the products exported or used locally, points out a November 29, 1951, American Embassy dispatch from Bangkok.

United Kingdom

SEAL OIL VENTURE MAY BE ABANDONED: The Colonial Development Corporation of the United Kingdom may have to abandon its seal oil venture in the Falkland Islands unless labor reinforcements are obtained by the beginning of this summer's hunting season, according to an article in the January 28 issue of Foreign Corps and Markets.

At present the labor force operating the processing factory at Fort Albemarle, established in July 1950, numbers 7 instead of the desired 24 and, although the sealing ships are fully manned, the hunting season, which is normally concluded about January 15, was discontinued in November 1951.

In 1950, the first year of operation, 177 tons of seal oil were produced. Production decreased to only 78 tons in 1951 instead of increasing to the 300-ton output estimated at the beginning of the season. Prices also have dropped. Instead of the £165 per long ton ($412 per short ton) in 1950, the price of seal oil as of mid-January 1952 was quoted at £110-£120 ($275-$300). Last year's stocks of seal oil have yet to be disposed of, however, and even less satisfactory prices are expected.

FEDERAL ACTIONS

Department of Commerce

ESSENTIAL ACTIVITIES LIST REVISED: The Secretary of Commerce on January 16 issued a revised List of Essential Activities for use in connection with the revised list of critical occupations released May 7, 1951, by the Department of Labor. No activities were removed from the Commerce list, but several additions were made which in no way affect the fisheries and allied industries. Commercial fishing and food processing are still included in the list.

These lists are prepared for use by the Department of Defense for considering requests for delaying calls to active duty of reservists and the National Guard. They are also made available to local draft boards of the Selective Service System as information to assist them in making determinations on requests for deferment of registrants. These agencies have the responsibility for making determinations on requests for military deferments.

NOTE: SEE COMMERCIAL FISHERIES REVIEW, JUNE 1951, PP. 78-9.

BUREAU OF THE CENSUS

FRESH AND FROZEN TUNA IMPORT DATA REVISED: The manner in which tuna imports are described and declared on import entries filed with Collectors of Customs may sometimes result in the United States import statistics not providing the most effective information from the viewpoint of economic analysis, states a February news release from the Bureau of the Census, Department of Commerce.

It has recently been found that a situation of this general type has existed with respect to imports of fresh or frozen tuna (Schedule A Commodity Number 0058 000) from Costa Rica and Canal Zone. The situation does not apparently apply to other countries. Some transactions reported as imports of tuna from Costa Rica and the Canal Zone actually represent tuna caught by United States-flag fishing vessels and are, therefore, "Products of American Fisheries" which should be excluded from the import statistics. It should be noted that fresh or frozen tuna of foreign origin is not dutiable. In some cases the importer has not claimed free entry of tuna which are Products of American Fisheries under the provisions applying to such products, but has described them on import entries merely as tuna free under the tariff paragraph applying to foreign tuna (Tariff Paragraph 1756), due to the fact that certain supporting papers must be filed to prove their origin as Products of American Fisheries.

Table 1 shows the fresh and frozen tuna imports January-November 1951 as originally reported.

Since some transactions reported as imports from Costa Rica and the Canal Zone actually represent tuna caught by United States-flag fishing vessels and are, therefore, "Products of American Fisheries" which should be excluded from the import statistics, the Bureau of the Census has been rechecking the 1951 fresh and frozen tuna imports. A check of imports for September 1951 showed that imports from Costa Rica and the Canal Zone during that month were overstated by approximately 60 percent. The Bureau then checked and revised the fresh and frozen tuna import data for the other months of 1951.

The results of the verification of these transactions for January-November 1951 are shown in table 2. It will be noted from these figures that imports from Costa Rica and Canal Zone for January-November 1951 were overstated by approximately 50 percent and the total imports from all countries were overstated by approximately 10 percent. Because of the work involved and because total imports of fresh and frozen tuna were smaller in 1950 and prior years than in 1951, an investigation will not be made of the figures for years prior to 1951.

Table 1 - United States Imports of Fresh and Frozen Tuna for Consumption, Jan.-Nov. 1951, As Originally Reported (Schedule A Commodity No. 0058 000)

Country of Origin	Quantity	Value
	lbs.	$
Canada	68,248	9,958
Mexico	2,650	307
Nicaragua	230,000	34,500
Costa Rica	3,294,329	408,425
Canal Zone	9,314,000	1,243,670
Bahamas	345	28
Ecuador	719,844	81,825
Peru	19,911,078	1,749,731
Chile	164,657	19,878
United Kingdom	136,000	9,300
Japan	35,590,991	5,186,016
Total	69,432,142	8,743,638

Arrangements can be made to have the flag of the "catching vessel" shown on future import entries covering arrivals of all fish which may be imported from foreign countries free of duty. This flag information will than make it possible to differentiate between imports from foreign countries and "Products of American Fisheries" so that the transactions may be correctly reflected in the statistics.

Table 2 - Fresh and Frozen Tuna Imports from Costa Rica and Canal Zone, January-November 1951 (As Originally Reported and as Revised)

Country	As Originally Reported		As Revised (Foreign Flag-True Imports)	
	Quantity	Value	Quantity	Value
	lbs.	($)	lbs.	($)
Costa Rica	3,294,329	408,425	1,614,661	200,920
Canal Zone	9,314,000	1,243,670	3,900,000	573,450
Total all countries	69,432,142	8,743,142	62,338,474	7,865,417

Table 3 - United States Imports of Fresh and Frozen Tuna for Consumption, 1950 and 1951

Country of Origin	1951 1/	1950 2/
	lbs.	lbs.
Japan	35,727,729	25,369,025
Peru	20,237,879	13,256,234
Costa Rica	1,614,661	9,621,159
Canal Zone	3,900,000	5,904,000
Ecuador	896,807	973,298
Canada	68,248	891,312
Norway	-	328,417
Mexico	2,650	49,691
Other countries	531,002	318,460
Total	62,978,976	56,711,596

1/REVISED. TUNA CAUGHT BY UNITED STATES-FLAG FISHING VESSELS AND REPRESENTING PRODUCTS OF AMERICAN FISHERIES ARE EXCLUDED.
2/TUNA IMPORTS FROM COSTA RICA AND THE CANAL ZONE INCLUDE A SUBSTANTIAL QUANTITY OF TUNA CAUGHT BY UNITED STATES-FLAG FISHING VESSELS WHICH SHOULD HAVE BEEN EXCLUDED IF PROPERLY REPORTED.

It is not known whether the situation which has existed in the case of fresh and frozen tuna has also existed with respect to other fish which are not dutiable (fresh or frozen sea herring, smelts and certain shellfish). If the flag information shown on future entries indicates that fish other than fresh and frozen tuna caught by American flag vessels are being entered under the tariff paragraphs applying to fish of foreign origin, the 1951 import statistics on these other fish will also be investigated.

Table 3 gives the corrected and revised data for imports of fresh and frozen tuna for 1951 as compared with the unrevised data for imports during 1950.

Economic Stabilization Agency

OFFICE OF PRICE STABILIZATION

INTERIM FOOD MARGIN SURVEY: Survey forms went out to a representative cross-section of the entire wholesale and retail food distribution trade to start the OPS nationwide interim survey of margins and earnings under the OPS grocery ceiling price regulations, according to a December 18 news release.

Receivers of the forms have been requested to fill them out and return them to OPS national headquarters in Washington in the shortest possible time. Data gathered through the forms will permit the agency to determine more accurately whether any adjustments are needed in the markup percentages in the regulations.

The interim survey will give OPS an immediate idea of the earnings position of the food distribution industry and of the nature and scope of the relief, if any, which is justified by the data submitted. It is pointed out that if any adjustment is granted on the basis of findings from this survey it will be temporary, pending completion of a more thorough survey which is to be made jointly by the Bureau of Labor Statistics and OPS. This survey is scheduled to begin shortly after the first of the year.

For details see: Press release OPS-CPR-1111, issued Dec. 18, 1951.

NOTE: FULL TEXTS OF PRICE ORDERS MAY BE OBTAINED FROM THE OFFICE OF PRICE STABILIZATION, WASHINGTON 25, D. C., OR FROM THE REGIONAL OPS OFFICE IN YOUR AREA.

WAGE STABILIZATION BOARD

RULING ON HEALTH AND WELFARE CONTRIBUTIONS: The Wage Stabilization Board ruled on February 1, 1952, that in certain circumstances employers and employees may place their health and welfare contributions in a temporary escrow fund pending Board action on the schedule of benefits to be financed by the contributions.

General Wage Regulation 19 and Resolution 78, adopted by the WSB last month, deal with health and welfare plans on the basis of the benefits rather than on a cost basis.

The Regulation and Resolution establish certain criteria under which health and welfare plans can be put into effect automatically 30 days after the plan is reported to the Board on a prescribed form, unless the filing party is notified to the contrary.

If the terms of the proposed plan or of the modification of an old plan vary from the definitions of Regulation 19 or contain any of the features listed in the Resolution 78, such plans will be submitted to a newly-established, tripartite health and welfare committee for action.

Some employers and employees agree, however, on a fixed contribution to a fund for health and welfare benefits—so many cents per hour, a certain percentage of payroll, etc.—and leave the benefits to be financed from the fund to be worked out later.

Under Regulation 19 and Resolution 78, the WSB cannot act on a welfare plan geared to costs and must wait until the parties submit the schedule of benefits.

The action of the Board authorizes the parties to start making their contributions to the health and welfare fund immediately and place the money in a temporary escrow fund until the benefits have been spelled out and reported to the WSB for action.

If the benefits ultimately approved by the Board can be financed at a cost less than the contributions agreed on by the parties, the excess shall be returned to the contributing employers and employees.

If no report is filed with the Board pursuant to Regulation 19 within six months of the effective date of each contribution or July 1, 1952, whichever is later, the entire temporary escrow fund shall be returned to the contributing employers and employees in proportion to their contribution.

Department of the Interior

DEFENSE FISHERIES ADMINISTRATION

CONTROLLED MATERIALS AVAILABLE FOR FISH PLANT CONSTRUCTION: In mid-January the Defense Fisheries Administration received from the Defense Production Administration an allocation of 712 tons of steel and small quantities of other controlled materials for use in the construction of fish plants during the second quarter of 1952. Requests already received for the materials are now being processed.

Firms requiring more than 25 tons of carbon steel, including not more than 2½ tons of alloy steel, no stainless steel, 2,000 pounds of copper products, and 1,000 pounds of aluminum for the construction of fish plants during the second quarter of 1952 were requested early in January to submit requests for the materials to the Defense Fisheries Administration, Department of the Interior, Washington 25, D.C. on NPA form CMP-4C. If less than the quantities of controlled materials indicated above were required, the builder or contractor did not have to submit the CMP-4C form, as he is authorized to self-certify the purchase orders in accordance with the provisions of CMP-Regulation 6.

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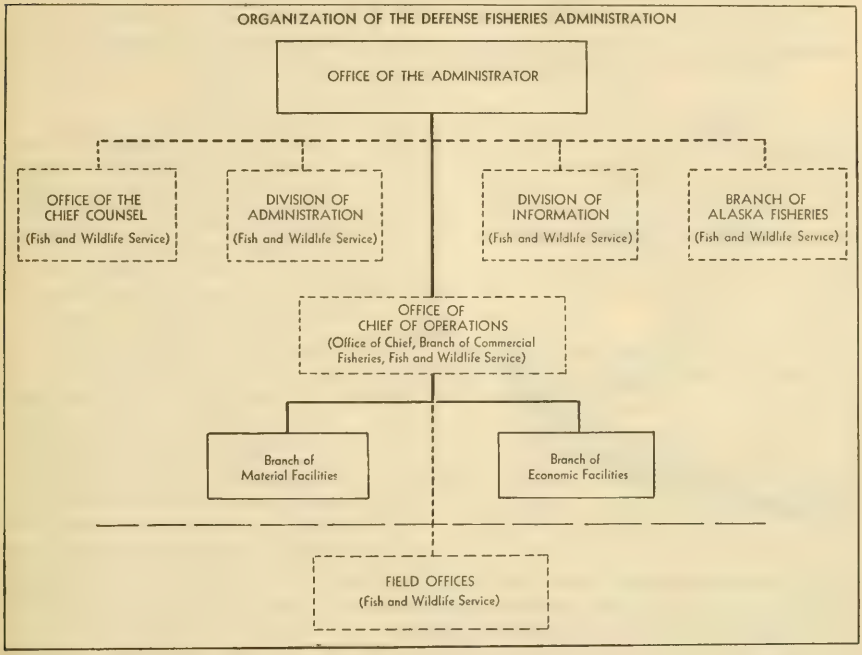
REORGANIZATION ANNOUNCED: The discontinuance of the field offices of the Defense Fisheries Administration, in the interest of economy, and the transfer of the functions of these offices to the seven Market News Service Offices of the Branch of Commercial Fisheries, were announced late in October. To effect further economies and to promote greater flexibility in the operation of the Defense Fisheries Administration, there has been a further reorganization.

The present reorganization abolishes the Office of the Program Director, and establishes a new Office of Chief of Operations, which is identical with the Office of the Chief of the Branch of Commercial Fisheries. Thus, A. W. Anderson, as Chief of the Branch of Commercial Fisheries, will also operate as Chief of the Office of Operations in the defense fisheries organization. The Branch of Material Facilities (E. A. Power, Chief) and the Branch of Economic Facilities (R. A. Kahn, Chief) of the Defense Fisheries Administration are transferred to operate under Anderson in his new capacity. In addition to the economics effected, this reorganization will facilitate a close working arrangement with the Market News Service Offices and will permit more flexibility in handling the defense workload by having operational supervision under the Chief of a Branch of the Fish and Wildlife Service which is concerned with industrial problems.

Fred F. Johnson, who has been Program Director of the Defense Fisheries Administration, is being designated Executive Officer in the Office of the Administrator of the Defense Fisheries Administration.

Maurice Rattray, formerly Deputy Administrator in the classified service, has

at his own request been transferred to the status of Expert on a part-time basis with the working title of Assistant to the Administrator.



NOTE: SEE COMMERCIAL FISHERIES REVIEW, NOV. 1951, P. 57

FISH AND WILDLIFE SERVICE

ALASKA FISHING REGULATIONS FOR 1952 ISSUED: New regulations for the protection of the commercial fisheries of Alaska during the 1952 fishing season were signed on February 11, the Secretary of the Interior announced on February 13.

In announcing the changes, the Secretary stated that the proposal made at the hearings to require an opening in trap leads resulted in such conflicting testimony that the matter has been dropped pending further investigation by the U. S. Fish and Wildlife Service during the coming season.

Changes of principal interest include a two-day fishing season per week in Cook Inlet; a later season extending from August 4 to August 30 in Prince William Sound; a limited early season for reds and chums in Southeastern Alaska from June 23 to July 5; and a prohibition against personal-use fishing by commercial fishermen during the season.

Highlights of the numerous changes are as follows:

The prohibition against fishing within 500 yards of any dam, fish ladder, etc., has been reduced to 300 feet and now applies to all artificial obstructions in streams.

A new section prohibiting the taking of salmon by snagging in waters not open to commercial fishing has been added this year in response to popular demand.

Commercial fishermen are restricted from fishing for personal use, except in compliance with commercial fishing regulations, within 48 hours of any commercial season. This does not apply to anyone not a commercial fisherman.

ALASKA (SEE OTHER CUT FOR SOUTHEASTERN ALASKA)

Yukon-Kuskokwim Area: The Kuskokwim River has been closed to commercial fishing at the request of local residents who require the entire runs for personal use and for dog feed.

The commercial season on the Yukon River has been extended throughout the month of August to permit a limited coho fishery.

Bristol Bay Area: As previously announced, the proposed curtailment in length of drift gill nets in Bristol Bay has been dropped and the length remains at 150 fathoms for drift gill nets and 50 fathoms for set nets. The weekly closed period in the Bristol Bay area has been set at 84 hours in anticipation of an increase in gear. Boats in this area are no longer required to be consecutively numbered. Each operator, however, will be required to report catches by boats and set nets daily. Persons fishing for personal use in 1952 will not be required to notify the Service of their intention to do so as was the case last year.

Alaska Peninsula Area: In the Alaska Peninsula area, outer Canoe Bay has been opened to fishing during that part of the regular season prior to July 18, and a fall season has been established in Izembek Bay from August 20 to September 5.

Chignik-Kodiak Area: In the Chignik and Kodiak areas, the opening date is June 16, and fishing in both areas is prohibited with drift gill nets. In the Alitak district of the Kodiak Island area, a minimum escapement of 250,000 red salmon is required, as measured at the Fish and Wildlife Service weirs.

SOUTHEASTERN ALASKA

Cook Inlet Area: In the Cook Inlet area, the season has been extended to August 12 in all sections to permit fishing for pinks. The weekly closed period has been extended to 120 hours to offset the tremendous influx of gear anticipated in the drift gill-net

fishery. This is in lieu of further curtailment of gear. In addition, tenders taking fish out of the area will be required to report the number of fish on board before leaving, so that the Fish and Wildlife Service can maintain up-to-the-minute statistics on the catches. The drastically extended weekly closed period will be relaxed if the anticipated amount of drift gill-net gear is not realized, and in any case it will not apply after July 28. A number of additional streams on the Kenai Peninsula have been closed to all fishing because of a tremendous increase in fishing for personal use from the new highway through the area.

Prince William Sound-Copper River-Bering River Area: The season in Prince William Sound has been changed to extend from August 4 to August 30, except in the Eshamy section which closes on the traditional date of August 22. In addition, the closed season on Dungeness crab fishing in inside waters has been extended to September 10, and fishing for razor clams for personal use is prohibited from July 1 to August 15. In the Copper River area, the weekly closed period is 84 hours a week, with the summer season extending from July 10 to September 18, inclusive. The extended weekly closed period will not apply after August 10. In the Bering River area, the seasons and weekly closed period have been adjusted to coincide with those in the adjacent Copper River area.

Yakutat Area: In the Yakutat area, the seasons have been advanced in Dry Bay to June 1, and delayed in Situk-Ahrnklin Inlet to July 1. A minimum escapement of 100,000 red salmon is required at the Situk River weir.

Southeastern Alaska Area: In Southeastern Alaska, the general seasons are from June 22 to July 5, from August 4 to August 30, and from October 6 to October 11. The seasons in all gill-net districts of Southeastern Alaska have been adjusted to open on June 18 and extend to September 30. The weekly closed period for gill-netting has been extended to include the time from 6 a.m. Friday to 6 a.m. Monday, but does not apply on the Stikine River after July 19. This applies to the northern section of the Western district, Taku Inlet, Port Snettisham, and the Stikine River. The eastern side of Stephens Passage has been reopened to fishing on the basis of relatively good escapements there. In arriving at the seasonal restrictions for Southeastern Alaska, it was recognized that the runs normally are later in the Prince of Wales Island streams, and that some adjustment might have to be made to permit fishing after August 30 if good runs appear. Prompt changes of this nature are provided for by a delegation of authority to responsible field officials of the Fish and Wildlife Service to extend or curtail fishing seasons to meet conditions as they occur.

Interstate Commerce Commission

PUBLICATION OF INCREASED EXPRESS RATES AUTHORIZED: The Railway Express Agency was authorized by the Interstate Commerce Commission the latter part of January to publish an increased charge of 6 cents per shipment on all LCL rail express shipments moving at first-class rates and multiples thereof and at second-class rates and charges. The increase was requested by the Railway Express Agency on the basis of higher wage costs under an escalator clause in the contract with a labor union.

Increased express rates and charges were authorized in Interstate Commerce Commission docket Ex Parte No. 177, according to a recent announcement by that agency. Based on the record in the proceedings, and as a result of the third supplemental petition dated January 16, 1952, by the Railway Express Agency and Class I Railroads for authority to increase first-class rates and multiples thereof and second-class

rates and charges on one day's notice by publishing an additional charge of 6 cents per shipment on all less-than-carload rail express shipments moving at first-class rates and multiples thereof and at second-class rates and charges:"

The ICC ordered, "That the orders heretofore entered in this proceeding, and outstanding unexpired orders in other proceedings be, and they are hereby, modified so as to permit publication of the increases in express rates and charges above specified in said petition dated January 16, 1952."

Particular note should be made that this action is not applicable to fishery products shipments made under the commodity tariffs published by the Railway Express Agency, Inc.

It was further ordered, "That the authorization does not constitute an approval of any increases in express rates and charges which may be published hereunder and is without prejudice to any conclusion which the Commission may reach as to their lawfulness pursuant to any investigation which may be instituted upon suspension, complaint, or the Commission's own motion."

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INCREASED LCL EXPRESS FISH RATES BETWEEN MIDWEST AND EASTERN POINTS DENIED BY ICC: The Railway Express Agency in 1949 proposed LCL rates for fresh fish and shellfish shipments from producing points and markets in the Great Lakes and upper Mississippi River areas to destinations generally north of the Ohio River and east of the Missouri River, except in New England. On January 16 this year the Interstate Commerce Commission announced its findings to the effect that the increased rates were "not shown to be just and reasonable." The Commission ordered that schedules be cancelled on or before February 25, 1952, and stated that proceedings in Investigation and Suspension Docket No. 5730, which covered these proposed increases, be discontinued.

In its conclusion the Commission's report states:

"In the final report in Ex Parte No. 177, after considering evidence which, in general, differed little from that before us here, the Commission disapproved increases on seafood such as those herein proposed, and approved increases in commodity rates and charges on food and drink, including seafood, of 22.5 cents per shipment on shipments under 100 pounds, and 22.5 cents per 100 pounds, minimum charge $1.50 per shipment, on shipments of 100 pounds or over. The record before us warrants like conclusions with respect to the increases here proposed."

NOTE: SEE COMMERCIAL FISHERIES REVIEW, NOVEMBER 1951, P. 58.

Department of Labor

"MASTERS AND PILOTS" DEFINITION EXPANDED IN CRITICAL OCCUPATIONS LIST: The definition for "Masters and Pilots" in the list of critical occupations issued by the Department of Labor was expanded on January 6, 1952. The definition was liberalized so that masters and pilots to qualify must not necessarily have a U. S. Coast Guard master's or pilot's license.

The license requirements are not liberalized for mates or engineers.

In place of the former category "Shipmaster, Ship Pilot, and Mates," the following two categories have been included in the list of critical occupations:

"Masters and Pilots: Has complete charge of or is responsible for navigating and controlling movements of commercial vessels, except those used in pleasure fishing and for other recreational purposes, and is regularly employed.

"Licensed Mates: Navigates and controls movements of commercial vessels which are required to have licensed officers. Holds U. S. Coast Guard Mate's license and is regularly employed in a position for which he is required to have such a license."

For details see: Third Addition to List of Critical Occupations dated May 7, 1951, issued January 6, 1952.

Also see: Commercial Fisheries Review, June 1951, pp. 103-4.

Maritime Administration

BID FOR "SS PACIFIC EXPLORER" ACCEPTED: A bid of $181,387.87 for the purchase of the SS Pacific Explorer from the Zidell Machinery and Supply Co., Portland, Oregon, was accepted by the Maritime Administration, according to a January 9 news release from that agency. Eight bids were received for the sale of the vessel and the one accepted was the high bid.

Under the terms of the bid, the vessel cannot carry cargo or passengers in foreign trade within ten years after the sale. The purchaser must agree that the ship will not be scrapped but be preserved as an operating unit for a period of not less than five years from date of sale.

The SS Pacific Explorer was built in 1919 for the former U. S. Shipping Board and was reacquired by the War Shipping Administration from Moore McCormack Lines during World War II. In May 1945, it was transferred to the Defense Plant Corporation of the Reconstruction Finance Corp. and converted to a fish-processing plant or mothership for a fleet of fishing vessels. The RFC operated the vessel through an agent, the Pacific Exploration Co., from January 1947 to December 1948. She was declared surplus by the RFC in 1949 and was placed in the Government Reserve Fleet at Astoria, Oregon, in October of that year.

Department of State

NEW U. S. COMMISSIONER NAMED TO NORTHWEST ATLANTIC FISHERIES COMMISSION: Dr. John L. Kask, recently appointed as Chief of the U. S. Fish and Wildlife Service's Office of Foreign Activities, has been named by the President as one of the three United States Commissioners of the International Commission for the Northwest Atlantic Fisheries. The other two commissioners are Bernhard Knollenberg, author and lawyer of Chester, Connecticut; and Francis W. Sargent, Director of the Division of Marine Fisheries, Commonwealth of Massachusetts, Boston, Massachusetts.

The Convention which established this Commission was concluded at Washington on February 8, 1949, by the United States, Canada, Denmark, France, Iceland, Italy, Newfoundland, Norway, Portugal, Spain, and the United Kingdom. It entered into force on July 3, 1950. The Convention is designed to provide for international cooperation by the contracting governments regarding measures required to maintain a maximum sustained yield from the fisheries of the Northwest Atlantic Ocean.

The first meeting of the International Commission, which was largely organizational in character, was held in Washington from April 2 to 10, 1951. For the time being, the Commission has established temporary headquarters in Canada at the St. Andrews Biological Station of the Fisheries Research Board of Canada, St. Andrews, New Brunswick.

The second meeting of the Commission is scheduled to be convened at St. Andrews about June 10, 1952.

* * * * *

INTERNATIONAL CONVENTION FOR THE NORTH PACIFIC OCEAN HIGH SEAS FISHERIES: At the conclusion of the Tripartite Fisheries Conference which convened at Tokyo, November 5, 1951, a document entitled "Resolutions and Request of the Tripartite Fisheries Conference" was signed by representatives of the United States, Canada, and Japan on December 14, 1951. Included in the documents is a recommendation that the three Governments conclude a Convention conforming to the draft agreed to by their representatives as soon as possible.

The Convention is based on the principle of voluntary abstention from certain fisheries to effect or maintain conservation programs. Essentially it is an agreement to conserve fisheries, with a special tripartite commission to be set up for enforcement and other purposes. The convention provides, in substance, that a contracting party will voluntarily abstain from fishing in waters where maximum fishing is under way and where conservation measures are being applied by one or two of the other contracting parties. Japan agrees to restrain its fishermen from catching salmon, halibut, and herring off traditional Canadian and American fishing grounds so long as the latter two countries exploit these fisheries resources to the maximum consistent with conservation needs. On the other hand, Japan is assured freedom to catch other types of fish in the North Pacific outside United States and Canadian territorial waters.

The draft fisheries convention between the United States, Canada, and Japan now awaits adoption by the governments of the three countries. After adoption, it will be signed at a formal ceremony after the coming into force of the Treaty of Peace with Japan.

The draft Convention, Annex, and a Protocol relating thereto as published by the Department of State on December 17 follows:

DRAFT
INTERNATIONAL CONVENTION FOR THE HIGH SEAS FISHERIES OF THE NORTH PACIFIC OCEAN

The Governments of the United States of America, Japan, and Canada, whose respective duly accredited representatives have subscribed hereto,

Acting as sovereign nations in the light of their rights under the principles of international law and custom to exploit the fishery resources of the high seas, and believing that it will best serve the common interest of mankind, as well as the interests of the contracting parties, to ensure the maximum sustained productivity of the fishery resources of the North Pacific Ocean, and that each of the parties should assume an obligation, on a free and equal footing, to encourage the conservation of such resources, and, recognizing that in view of these considerations it is highly desirable (1) to establish an international commission, representing the three parties hereto, to promote and coordinate the scientific studies necessary to ascertain the conservation measures required to secure the maximum sustained productivity of fisheries of joint interest to the contracting parties and to recommend such measures to such parties and (2) that each Party carry out such conservation recommendations, and provide for necessary restraints on its own nationals and fishing vessels, therefore agree as follows:

ARTICLE I.

1. The area to which this Convention applies, hereinafter referred to as "the Convention Area", shall be all waters, other than territorial waters, of the North Pacific Ocean which for the purposes hereof shall include the adjacent seas.

2. Nothing in this Convention shall be deemed to affect adversely (prejudice) the claims of any contracting party in regard to the limits of territorial waters or to the jurisdiction of a coastal state over fisheries.

3. For the purposes of this Convention the term "fishing vessel" shall mean any vessel engaged in catching fish or processing or transporting fish loaded on the high seas, or any vessel outfitted for such activities.

ARTICLE II.

1. In order to realize the objectives of this Convention, the contracting parties shall establish and maintain the International North Pacific Fisheries Commission, hereinafter referred to as "the Commission".

2. The Commission shall be composed of three national sections, each consisting of not more than four members appointed by the governments of the respective contracting parties.

3. Each national section shall have one vote. All resolutions, recommendations and other decisions of the Commission shall be made only by a unanimous vote of the three national sections except when under the provisions of Article III, Section 1(C)(ii) only two participate.

4. The Commission may decide upon and amend, as occasion may require, by-laws or rules for the conduct of its meetings.

5. The Commission shall meet at least once each year and at such other times as may be requested by a majority of the national sections. The date and place of the first meeting shall be determined by agreement between the contracting parties.

6. At its first meeting the Commission shall select a chairman, vice-chairman and secretary from different national sections. The chairman, vice-chairman and secretary shall hold office for a period of one year. During succeeding years selection of a chairman, vice-chairman and secretary from the national sections shall be made in such a manner as will provide each contracting party in turn with representation in those offices.

7. The Commission shall decide on a convenient place for the establishment of the Commission's headquarters.

8. Each contracting party may establish an advisory committee for its national section, to be composed of persons who shall be well informed concerning North Pacific fishery problems of common concern. Each such advisory committee shall be invited to attend all sessions of the Comission except those which the Commission decides to be in camera.

9. The Commission may hold public hearings. Each national section may also hold public hearings within its own country.

10. The official languages of the Commission shall be Japanese and English. Proposals and data may be submitted to the Commission in either language.

11. Each contracting party shall determine and pay the expenses incurred by its national section. Joint expenses incurred by the Commission shall be paid by the Commission through contributions made by the contracting parties in the form and proportion recommended by the Commission and approved by the contracting parties.

12. An annual budget of joint expenses shall be recommended by the Commission and submitted to the contracting parties for approval.

13. The Commission shall authorize the disbursement of funds for the joint expenses of the Commission and may employ personnel and acquire facilities necessary for the performance of its functions.

ARTICLE III.

1. The Commission shall perform the following functions:

(A) In regard to any stock of fish specified in the annex, study for the purpose of determining annually whether such stock continues to qualify for abstention under the provisions of Article IV. If the Commission determines that such stock no longer meets the conditions of Article IV, the Commission shall recommend that it be removed from the annex. Provided, however, that with respect to the stocks of fish originally specified in the annex, no determination or recommendation as to whether such stock continues to qualify for abstention shall be made for five years after the entry into force of this convention.

(B) To permit later additions to the annex, study, on request of a contracting party, any stock of fish of the Convention Area, the greater part of which is harvested by one or more of the contracting parties, for the purpose of determining whether such stock qualifies for abstention under the provisions of Article IV. If the Commission decides that the particular stock fulfills the conditions of Article IV it shall recommend, (1) that such stock be added to the Annex, (2) that the appropriate party or parties abstain from fishing such stock and (3) that the party or parties participating in the fishing of such stock continue to carry out necessary conservation measures.

(C) In regard to any stock of fish in the Convention Area:

(i) Study, on request of any contracting party concerned, any stock of fish which is under substantial exploitation by two or more of the contracting parties, and which is not covered by a conservation agreement between such parties existing at the time of the conclusion of this Convention, for the purpose of determining need for joint conservation measures;

(ii) Decide and recommend necessary joint conservation measures including any relaxation thereof to be taken as a result of such study. Provided, however, that only the national sections of the contracting parties engaged in substantial exploitation of such stock of fish may participate in such decision and recommendation. The decisions and recommendations shall be reported regularly to all the contracting parties, but shall apply only to the contracting parties the national sections of which participated in the decisions and recommendations.

(iii) Request the contracting party or parties concerned to report regularly the conservation measures adopted from time to time with regard to the stocks of fish specified in the Annex, whether or not covered by conservation agreements between the contracting parties, and transmit such information to the other contracting party or parties.

(D) Consider and make recommendations to the contracting parties concerning the enactment of schedules of equivalent penalties for violations of this Convention.

(E) Compile and study the records provided by the contracting parties pursuant to the Article VIII.

(F) Submit annually to each contracting party a report on the Commission's operations, investigations and findings, with appropriate recommendations, and inform each contracting party whenever it is deemed advisable, on any matter relating to the objectives of this Convention.

2. The Commission may take such steps, in agreement with the parties concerned, as will enable it to determine the extent to which the undertakings agreed to by the parties under the provisions of Article V, Section 2 and the measures recommended by the Commission under the provisions of this Article and accepted by the parties concerned have been effective.

3. In the performance of its functions, the Commission shall insofar as feasible, utilize the technical and scientific services of, and information from, official agencies of the contracting parties and their political subdivisions and may, when desirable and if available, utilize the services of, and information from, any public or private institution or organization or any private individual.

ARTICLE IV

1. In making its recommendations, the Commission shall be guided by the spirit and intent of this Convention and by the considerations below mentioned.

(A) Any conservation measures for any stock of fish decided upon under the provisions of this Convention shall be recommended for equal application to all parties engaged in substantial exploitation of such stock.

(B) With regard to any stock of fish which the Commission determines reasonably satisfies all the following conditions, a recommendation shall be made as provided for in Article III, Section 1 (B):

(i) Evidence based upon scientific research indicates that more intensive exploitation of the stock will not provide a substantial increase in yield which can be sustained year after year,

(ii) The exploitation of the stock is limited or otherwise regulated through legal measures by each party which is substantially engaged in its exploitation, for the purpose of maintaining or increasing its maximum sustained productivity; such limitations and regulations being in accordance with conservation programs based upon scientific research, and

(iii) The stock is the subject of extensive scientific study designed to discover whether the stock is being fully utilized and the conditions necessary for maintaining its maximum sustained productivity.

Provided, however, that no recommendation shall be made for abstention by a contracting party concerned with regard to: (1) any stock of fish which at any time during the 25 years next preceding the entry into force of this Convention has been under substantial exploitation by that party having regard to the conditions referred to in Section 2 of this Article; (2) any stock of fish which is harvested in greater part by a country or countries not party to this Convention; (3) waters in which there is historic inter-mingling of fishing operations of the parties concerned, an inter-mingling of the stocks of fish exploited by these operations, and of long-established history of joint conservation and regulation among the parties concerned so that there is consequent impracticability of segregating the operations and administering control. It is recognized that the conditions specified in subdivision (3) of this proviso apply to Canada and the United States of America in the waters of the Pacific Coast of the United States of America and Canada from and including the waters of the Gulf of Alaska southward and, therefore, no recommendation shall be made for abstention by either the United States of America or Canada in such waters.

2. In any decision of recommendation allowances shall be made for the effect of strikes, wars or exceptional economic or biological conditions which may have introduced temporary declines in or suspension of productivity, exploitation, or management of the stock of fish concerned.

ARTICLE V.

1. The Annex attached hereto forms an integral part of this Convention. All references to "Convention" shall be understood as including the said Annex either in its present terms or as amended in accordance with the provisions of Article VII.

2. The contracting parties recognize that any stock of fish originally specified in the Annex to this Convention fulfills the conditions prescribed in Article IV and accordingly agree that the appropriate party or parties shall abstain from fishing such stock and the party or parties participating in the fishing of such stock shall continue to carry out necessary conservation measures.

ARTICLE VI.

In the event that it shall come to the attention of any of the contracting parties that the nationals or fishing vessels of any country which is not a party to this Convention appear to affect adversely the operations of the Commission or the carrying out of the objectives of this Convention, such party shall call the matter to the attention of other contracting parties. All the contracting parties agree upon the request of such party to confer upon the steps to be taken towards obviating such adverse effects or relieving any contracting party from such adverse effects.

ARTICLE VII.

1. The Annex to this Convention shall be considered amended from the date upon which the Commission receives notification from all the contracting parties of acceptance of a recommendation to amend the Annex made by the Commission in accordance with the provisions of Article III, Section 1.

2. The Commission shall notify all the contracting parties of the date of receipt of each notification of acceptance of an amendment to the Annex.

ARTICLE VIII.

The contracting parties agree to keep as far as practicable all records requested by the Commission and to furnish compilations of such records and other information upon request of the Commission. No contracting party shall be required hereunder to provide the records of individual operations.

ARTICLE IX.

1. The contracting parties agree as follows:

(A) With regard to a stock of fish from the exploitation of which any contracting party has agreed to abstain, the nationals and fishing vessels of such contracting party are prohibited from engaging in the exploitation of such stock of fish in waters specified in the Annex, and from loading, processing, possessing, or transporting such stock of fish in such waters.

(B) With regard to a stock of fish for which a contracting party has agreed to continue to carry out conservation measures, the nationals and fishing vessels of such party are prohibited from engaging in fishing activities in waters specified in the Annex in violation of regulations established under such conservation measures.

2. Each contracting party agrees, for the purpose of rendering effective the provisions of this Convention, to enact and enforce necessary laws and regulations, with regard to its nationals and fishing vessels, with appropriate penalties against violations thereof and to transmit to the Commission a report on any action taken by each party with regard thereto.

ARTICLE X.

1. The contracting parties agree, in order to carry out faithfully the provisions of this Convention, to cooperate with each other in taking appropriate and effective measures and accordingly agree as follows:

(A) When a fishing vessel of a contracting party has been found in waters in which that party has agreed to abstain from exploitation in accordance with the provisions of this Convention, the duly authorized officials of any contracting party may board such vessel to inspect its equipment, books, documents, and other articles and question the persons on board.

Such officials shall present credentials issued by their respective governments if requested by the master of the vessel.

(B) When any such person or fishing vessel is actually engaged in operations in violation of the provisions of this Convention, or there is reasonable ground to believe was obviously so engaged immediately prior to boarding of such vessel by any such official the latter may arrest or seize such person or vessel. In that case, the contracting party to which the official belongs shall notify the contracting party to which such person or vessel belongs of such arrest or seizure and shall deliver such vessel or person as promptly as practicable to the authorized officials of the contracting party to which such vessel or person belongs at a place to be agreed upon by both parties. Provided, however, that the contracting party which gives such notification may keep such person or vessel under surveillance within its own territory, under the conditions agreed upon by both of the contracting parties.

(C) Only the authorities of the party to which the above-mentioned person or fishing vessel belongs may try the offense and impose penalties therefor. The witnesses and evidence necessary for establishing the offense, so far as they are under the control of any of the parties to this Convention, shall be furnished as promptly as possible to the contracting party having jurisdiction to try the offense.

2. With regard to the nationals or fishing vessels of one or more contracting parties in waters with respect to which they have agreed to continue to carry out conservation measures for certain stocks of fish in accordance with the provisions of this Convention, the contracting parties concerned shall carry out enforcement severally or jointly. In that case, the contracting parties concerned agree to report periodically through the Commission to the contracting party which has agreed to abstain from the exploitation of such stocks of fish on the enforcement conditions, and also, if requested, to provide opportunity for observation of the conduct of enforcement.

3. The contracting parties agree to meet, during the sixth year of the operation of this Convention, to review the effectiveness of the enforcement provisions of this Article and, if desirable, to further consider means by which they may more effectively be carried out.

ARTICLE XI.

1. This Convention shall be ratified by the contracting parties in accordance with their respective constitutional processes and the instruments of ratification shall be exchanged as soon as possible at Tokyo.

2. This Convention shall enter into force on the date of the exchange of ratifications. It shall continue in force for a period of ten years and thereafter until one year from the day on which a contracting party shall give notice to the other contracting parties of an intention of terminating the Convention, whereupon it shall terminate as to all contracting parties.

In witness whereof, the respective plenipotentiaries, duly authorized, have signed the present Convention.

ANNEX

1. With regard to the stocks of fish and the waters named below, Japan agrees to abstain from fishing, and Canada and the United States of America agree to continue to carry out necessary conservation measures, in accordance with the provisions of Article V, Section 2 of this Convention;

(A) Halibut (hippoglossus stenolepis).

The Convention Area off the coasts of Canada and the United States of America in which commercial fishing for halibut is being or can be prosecuted. Halibut referred to herein shall be those originating along the coast of North America.

(B) Herring (clupea pallasii).

The Convention Area off the coasts of Canada and the United States of America, exclusive of the Bering Sea and of the waters of the North Pacific Ocean west of the meridian passing through the extremity of the Alaskan peninsula, in which commercial fishing for herring of North American origin is being or can be prosecuted.

(C) Salmon (oncorhynchus gorbuscha, oncorhynchus keta, oncorhynchus kisutch, oncorhynchus nerka, oncorhynchus tschawytscha).

The Convention Area off the coasts of Canada and the United States of America, exclusive of the Bering Sea and of the waters of the North Pacific Ocean west of a provisional line following the meridian passing through the western extremity of Atka Island, in which commercial fishing for salmon originating in the rivers of Canada and the United States of America is being or can be prosecuted.

2. With regard to the stocks of fish and the waters named below, Canada and Japan agree to abstain from fishing, and the United States of America agrees to continue to carry out necessary conservation measures, in accordance with the provisions of Article V, Section 2 of this Convention:

Salmon (oncorhynchus gorbuscha, oncorhynchus keta, oncorhynchus kisutch, oncorhynchus nerka and oncorhynchus tschawytscha).

The Convention Area of the Bering Sea, east of the line starting from Cape Prince of Wales on the west coast of Alaska, running westward to 168 degrees 58 minutes 22.59 seconds west longitude; thence due south to a point 65 degrees, 15 minutes 00 seconds north latitude; thence along the Great Circle course which passes through 51 degrees north latitude and 167 degrees east longitude, to its intersection with meridian 175 degrees west longitude; thence south along a provisional line which follows this meridian to the territorial waters limit of Atka Island; in which commercial fishing for salmon originating in the rivers of the United States of America is being or can be prosecuted.

PROTOCOL

Protocol to the proposed International Convention for the High Seas Fisheries of the North Pacific Ocean.

The Governments of Canada, Japan and the United States of America, through their respective plenipotentiaries, agree upon the following stipulation in regard to the International Convention for the High Seas Fisheries of the North Pacific Ocean, signed at Tokyo on this 14th day of December, nineteen hundred and fifty-one:

The Governments of Canada, Japan and the United States of America agree that the line of meridian 175 degrees west longitude and the line following the meridian passing through the western extremity of Atka Island, which have been adopted for determining the areas in which the exploitation of salmon is abstained or the conservation measures for salmon shall be enforced in accordance with the provisions of the Annex to this Convention, shall be considered as provisional lines which shall continue in effect subject to confirmation or readjustment in accordance with the procedure mentioned below.

The Commission to be established under the Convention shall, as expeditiously as practicable, investigate the waters of the convention area to determine if there are areas in which salmon originating in rivers of Canada and of the United States of America intermingle with salmon originating in the rivers of Asia. If such areas are found the Commission shall conduct suitable studies to determine a line or lines which best divide salmon of Asiatic origin and salmon of Canadian and United States of America origin, from which certain contracting parties have agreed to abstain in accordance with the provisions of Article IV, and whether it can be shown beyond a reasonable doubt that this line or lines more equitably divide such salmon than the provisional lines specified in sections 1(C) and 2 of the Annex.

In accordance with these determinations the Commission shall recommend that such provisional lines be confirmed or that they be changed in accordance with these results, giving due consideration to adjustments required to simplify administration.

In the event, however, the Commission fails within a reasonable period of time to recommend unanimously such line or lines, it is agreed that the matter shall be referred to a special committee of scientists consisting of three competent and disinterested persons, no one of whom shall be a national of a contracting party, selected by mutual agreement of all parties for the determination of this matter.

It is further agreed that when a determination has been made by a majority of such special committee, the commission shall make a recommendation in accordance therewith.

The Governments of Canada, Japan and the United States of America, in signing this Protocol, desire to make it clear that the procedure set forth herein is designed to cover a special situation. It is not, therefore, to be considered a precedent for the final resolution of any matters which may, in the future, come before the Commission.

This Protocol shall become effective from the date of entry into force of the said Convention.

In witness whereof, the respective plenipotentiaries have signed this Protocol.

* * *

Department of the Treasury

BUREAU OF CUSTOMS

1952 TARIFF-RATE QUOTA FOR GROUNDFISH (INCLUDING OCEAN PERCH) FILLETS: The reduced-tariff-rate quota on fresh and frozen groundfish (cod, haddock, hake, pollock, cusk, and ocean perch or rosefish) fillets for 1952 is 31,472,108 pounds, the Bureau of Customs announced on January 11. The annual quota for groundfish fillets is the quantity entitled to be entered for consumption on a quarterly basis in the United States at the rate of 1-7/8 cents per pound. Divided into quarterly quotas, this means that 7,868,027 pounds of groundfish fillets during each quarter will be imported at the 1-7/8 cents-per-pound rate of duty.

The tariff-rate quota for 1952 is 7.6 percent higher than the quota of 29,239,808 pounds established for 1951 and almost 20 percent higher than the quota of 26,235,738 pounds established in 1950.

The announcement as it appeared in the Federal Register of January 17 was as follows:

The tariff-rate quota for the calendar year 1952 on certain fish dutiable under paragraph 717 (b), Tariff Act of 1930, as modified pursuant to the General Agreement on Tariffs and Trade (T. D. 51802).

In accordance with the proviso to item 717 (b) of Part 1, Schedule XX, of the General Agreement on Tariffs and Trade (T. D. 51802), it has been ascertained that the average aggregate apparent annual consumption in the United States of fish, fresh, or frozen (whether or not packed in ice), filleted, skinned, boned, sliced, or divided into portions, not specially provided for: Cod, haddock, hake, pollock, cusk, and rosefish, in the three years preceding 1952, calculated in the manner provided for in the cited agreement was 209,814,054 pounds. The quantity of such fish that may be imported for consumption during the calendar year 1952 at the reduced rate of duty established pursuant to that agreement is, therefore, 31,472,108 pounds.

[SEAL] D. B. STRUBINGER,
Acting Commissioner of Customs.

NOTE: SEE COMMERCIAL FISHERIES REVIEW, FEBRUARY 1951, PP. 40-1, 95-6.

* * * * *

REGULATION OF VESSELS EMPLOYED IN FISHING: In order to describe in greater detail the privileges and limitations upon the use of foreign fishing vessels, the December 14, 1951, issue of the Federal Register contained a revision of Section 4.96 of Customs Regulations of 1943. The full text of the revised section follows:

PART 4—VESSELS IN FOREIGN AND DOMESTIC TRADES

REGULATION OF VESSELS EMPLOYED IN FISHING

Section 4.96, Customs Regulations of 1943, is revised so as to describe in greater detail the privileges and limitations upon the use of foreign fishing vessels, particularly in view of the 1950 convention between the United States and Canada (T. D. 52862) which, among other things, grants Canadian fishing vessels engaged only in the North Pacific halibut fishery the right to land their catches of halibut and incidentally-caught sable fish in ports of entry on the Pacific coast of the United States; and in view of the amendment of section 4311 of the Revised Statutes (46 U. S. C. 251) by the act of September 2, 1950 (64 Stat. 577), which, except as otherwise specified by treaty or convention, prohibits a foreign flag vessel from landing in the United States its catch of fish taken on board on the high seas, or fish products processed therefrom, or fish or fish products taken on board on the high seas from another vessel engaged in fishing operations or in the processing of fish or fish products.

Section 4.96, Customs Regulations of 1943 (19 CFR 4.96), as amended, is further amended to read as follows:

§ 4.96 *Fisheries.* (a) As used in this section:

(1) The term "convention vessel" means a Canadian fishing vessel which, at the time of its arrival in the United States, is engaged only in the North Pacific halibut fishery and which is therefore entitled to the privileges provided for by the Halibut Fishing Vessels Convention between the United States and Canada signed at Ottawa on March 24, 1950 (T. D. 52862);

(2) The term "nonconvention fishing vessel" means any vessel other than a convention vessel which is employed in whole or in part in fishing at the time of its arrival in the United States and

(i) Which is documented under the laws of a foreign country,

(ii) Which is undocumented, of 5 net tons or over, and owned in whole or in part by a person other than a citizen of the United States, or

(iii) Which is undocumented, of less than 5 net tons, and owned in whole or in part by a person who is neither a citizen nor a resident of the United States;

(3) The term "nonconvention cargo vessel" means any vessel which is not employed in fishing at the time of its arrival in the United States, but which is engaged in whole or in part in the transportation of fish or fish products [12]a and

(i) Which is documented under the laws of a foreign country or

(ii) Which is undocumented and owned by a person other than a citizen of the United States; and

(4) The term "fishing" means the planting, cultivation, or taking of fish, shell fish, marine animals, pearls, shells, or marine vegetation, or the transportation of any of those marine products to the United States by the taking vessel or another vessel under the complete control and management of a common owner or bareboat charterer.

(b) Except as provided for in paragraph (d), (e), or (g) of this section, no vessel employed in fishing, other than a vessel of the United States or a vessel of less than 5 net tons owned in the United States, shall come into a port or place in the United States.[12]b

(c) A vessel of the United States to be employed in fishing may be enrolled and licensed, or licensed, depending upon its size, or registered. If registered, the

vessel must be entitled to be licensed or enrolled and licensed for the fisheries. (See §§ 3.2 and 3.42 of this chapter.)

(d) A convention vessel may come into a port of entry on the Pacific coast of the United States, including Alaska, to land its catch of halibut and incidentally-caught sable fish, or to secure supplies, equipment, or repairs. Such a vessel may come into any other port of entry or, if properly authorized to do so under § 1.2 (b) of this chapter, into any place other than a port of entry, for the purpose of securing supplies, equipment, or repairs only, but shall not land its catch. A convention vessel which comes into the United States as provided for in this paragraph shall comply with the usual requirements applicable to foreign vessels arriving at and departing from the United States.

(e) A nonconvention fishing vessel may come into a port of entry in the United States or, if granted permission under § 1.2 (b) of this chapter, into a place other than a port of entry for the purpose of securing supplies, equipment, or repairs, but shall not land its catch. A nonconvention fishing vessel which comes into the United States as provided for in this paragraph shall comply with the usual requirements applicable to foreign vessels arriving at and departing from ports of the United States.

(f) A nonconvention cargo vessel, although not prohibited by by law from coming into the United States, shall not be permitted to land in the United States its catch of fish taken on the high seas or any fish or fish products taken on board on the high seas from a vessel employed in fishing or in the processing of fish or fish products, but may land fish taken on board at any place other than the high seas upon compliance with the usual requirements. Before any such fish may be landed the master shall satisfy the collector that the fish were not taken on board on the high seas by presenting affidavits of the master and two or more officers or members of the crew of the vessel, of whom the person next in authority to the master shall be one, or other evidence acceptable to the collector which establishes the place of lading to his satisfaction.

(g) A convention vessel, a nonconvention fishing vessel, or a nonconvention cargo vessel which arrives in the United States in distress shall be subject to the usual requirements applicable to foreign vessels arriving in distress. While in the United States, supplies, equipment, or repairs may be secured, but, except as specified in the next sentence, fish shall not be landed unless the vessel's master, or other authorized representative of the owner, shows to the satisfaction of the collector that it will not be possible, by the exercise of due diligence, for the vessel to transport its catch to a foreign port without spoilage, in which event the collector may allow the vessel, upon compliance with all applicable requirements, to land, transship, or otherwise dispose of its catch. Nothing herein shall prevent a convention vessel arriving in distress from landing its catch of halibut and incidentally-caught sable fish at a port of entry on the Pacific coast, including Alaska, upon compliance with normal customs procedures, nor prevent a foreign cargo vessel arriving in distress from landing, upon compliance with normal customs procedures, its cargo of fish taken on board at any place not on the high seas.

(h) A registered vessel may be cleared for a whaling voyage[221c] under the same terms and conditions as though it were enrolled and licensed for the whale fishery.

(R. S. 161, sec. 2, 23 Stat. 118, R. S. 4132, as amended, R. S. 4311, as amended, R. S. 4339; 5 U. S. C. 22, 46 U. S. C. 2, 11, 251, 280)

[221a] "* * * Except as otherwise provided by treaty or convention to which the United States is a party, no foreign-flag vessel shall, whether documented as a cargo vessel or otherwise, land in a port of the United States its catch of fish taken on board such vessels on the high seas or fish products processed therefrom, or any fish or fish products taken on board such vessel on the high seas from a vessel engaged in fishing operations or in the processing of fish or fish products." (46 U. S. C. 251.)

[221b] "Vessels of twenty tons and upward, enrolled in pursuance of sections 251-255, 258, 259, 262-280, 293, 306-316, 318,-321-330 and 333-335 of this title, and having a license in force, or vessels of less than twenty tons, which, although not enrolled, have a license in force, as required by such sections, and no others, shall be deemed vessels of the United States entitled to the privileges of vessels employed in the coasting trade or fisheries. * * *" (46 U. S. C. 251)

[SEAL] FRANK DOW,
Commissioner of Customs.

Approved: December 7, 1951.

JOHN S. GRAHAM,
Acting Secretary of the Treasury.

Eighty-Second Congress (Second Session)

January 1952

On Tuesday, January 8, Congress reconvened in the Second Session of the Eighty-Second Congress. All bills introduced in the First Session carry over to the present session.

Listed below are public bills and resolutions introduced and referred to committees, or passed by the Eighty-Second Congress (Second Session) and signed by the President. However, the more pertinent reports, hearings, or chamber actions on some of the bills shown in this section from month to month are also listed.

BILLS AND RESOLUTIONS INTRODUCED:

Alaska Fisheries Act Amendment: H. R. 6284 (Bartlett) - A bill to amend the Alaska Fisheries Act; to the Committee on Merchant Marine and Fisheries. (Contains a few amendments to the Act.)

Canned Tuna Import Duty: H. R. 5883 (Mack of Wash.) - A bill to amend the Tariff Act of 1930, so as to impose certain duties upon the importation of tuna fish. (Provides a 45 percent ad-valorem duty for canned tuna packed in airtight containers weighing with contents not more than fifteen pounds.)

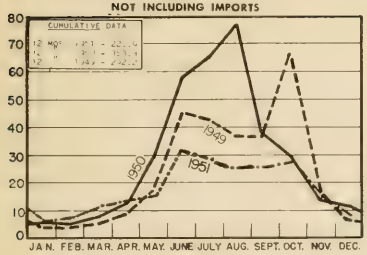
Fats and Oils Controls Repeal: H. R. 5943 (Celler) - A bill to repeal section 104 of the Defense Production Act of 1950, as amended; Committee on Banking and Currency. (The section imposes import controls on fats and oils and related products, including fish oils.)

Restricts Application of Fish Exemption for Motor Carriers: S. 2357 (Johnson of Colorado) - A bill to amend the Interstate Commerce Act to restrict the application of the agricultural and fish exemption for motor carriers; to the Committee on Interstate and Foreign Commerce. Amends (b) Section 203 (b) (6) of the Interstate Commerce Act (49U.S.C. sec. 303 (b) (6))to read: "(6) motor vehicles transporting unprocessed fish (including shellfish) to market for the fishermen catching such fish, if such motor vehicles are not used at the same time or the return trip or customarily in any other kind of transportation for compensation; or."

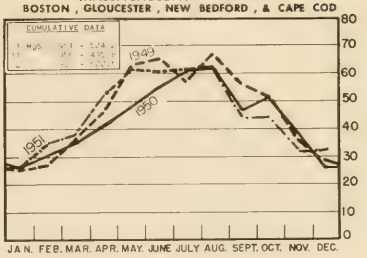
LANDINGS AND RECEIPTS

In Millions of Pounds

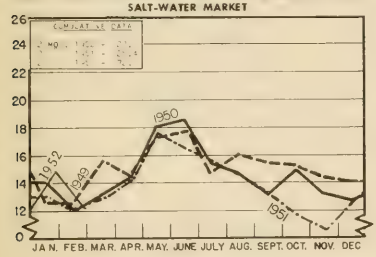
MAINE - LANDINGS
NOT INCLUDING IMPORTS



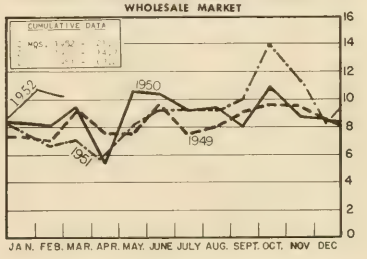
MASSACHUSETTS - LANDINGS
BOSTON, GLOUCESTER, NEW BEDFORD, & CAPE COD



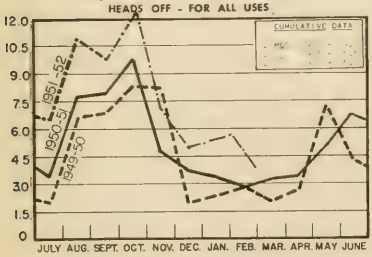
NEW YORK CITY-RECEIPTS OF FRESH & FROZEN FISH
SALT-WATER MARKET



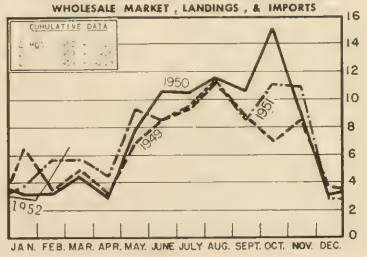
CHICAGO - RECEIPTS OF FRESH & FROZEN FISH
WHOLESALE MARKET



GULF - SHRIMP LANDINGS
HEADS OFF - FOR ALL USES

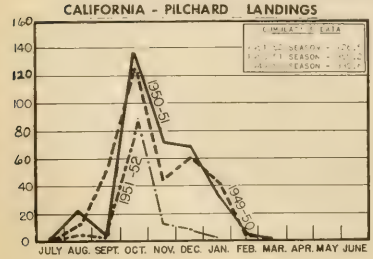


SEATTLE - RECEIPTS OF FRESH & FROZEN FISH
WHOLESALE MARKET, LANDINGS, & IMPORTS

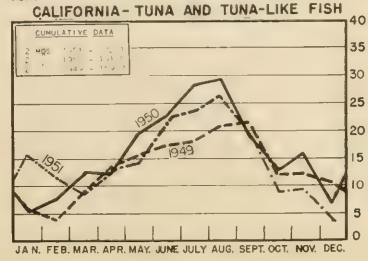


In Thousands of Tons

CALIFORNIA - PILCHARD LANDINGS



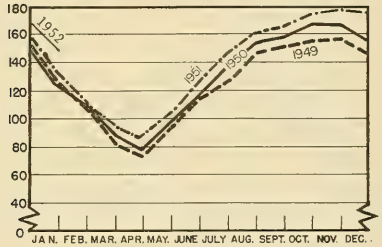
CALIFORNIA - TUNA AND TUNA-LIKE FISH



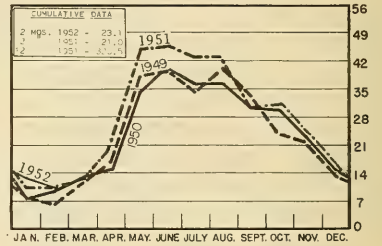
COLD STORAGE HOLDINGS and FREEZINGS of FISHERY PRODUCTS

In Millions of Pounds

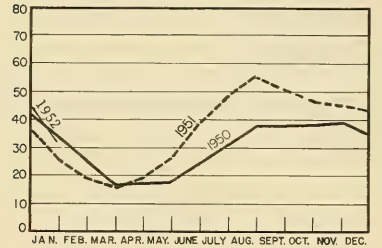
U.S. & ALASKA - HOLDINGS OF FROZEN FISH



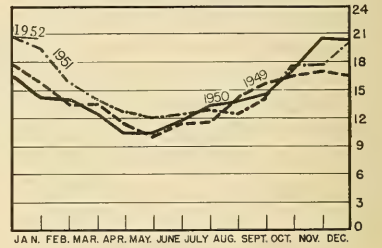
U.S. & ALASKA - FREEZINGS



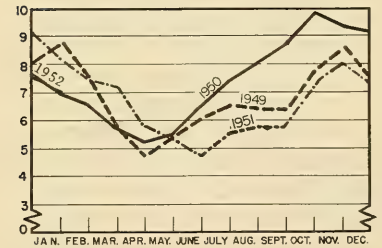
NEW ENGLAND - HOLDINGS OF FROZEN FISH



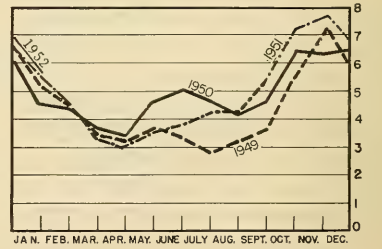
NEW YORK CITY - HOLDINGS OF FROZEN FISH



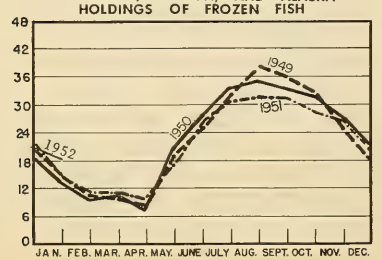
CHICAGO - HOLDINGS OF FROZEN FISH



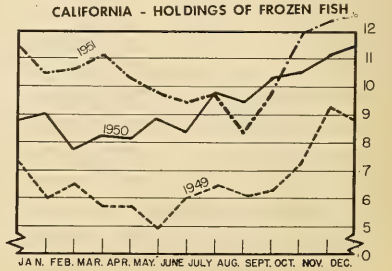
GULF - HOLDINGS OF FROZEN FISH



WASHINGTON, OREGON, AND ALASKA - HOLDINGS OF FROZEN FISH



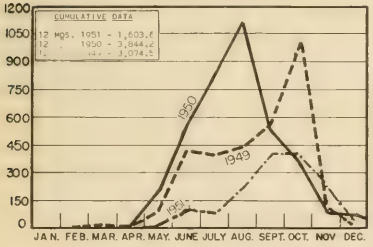
CALIFORNIA - HOLDINGS OF FROZEN FISH



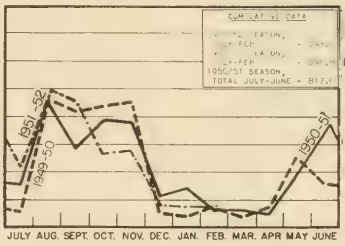
CANNED FISHERY PRODUCTS

In Thousands of Standard Cases

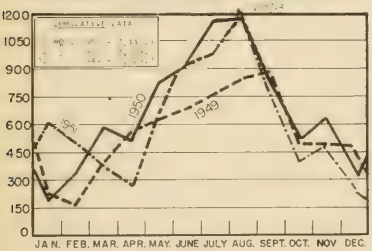
MAINE - SARDINES, ESTIMATED PACK



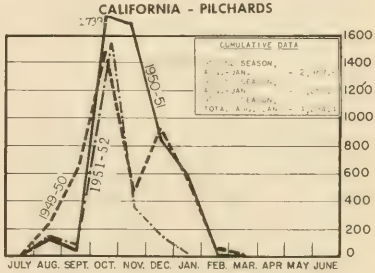
UNITED STATES - SHRIMP



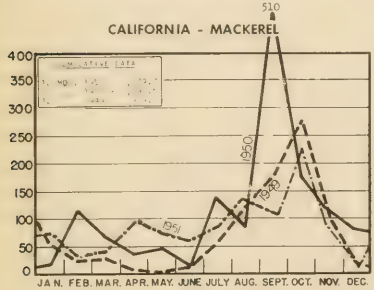
CALIFORNIA - TUNA AND TUNA-LIKE FISH



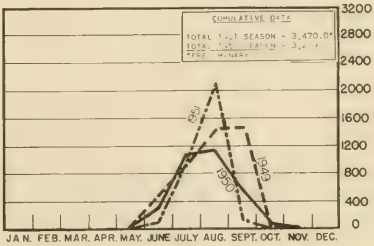
CALIFORNIA - PILCHARDS



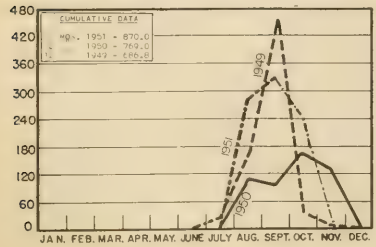
CALIFORNIA - MACKEREL



ALASKA - SALMON



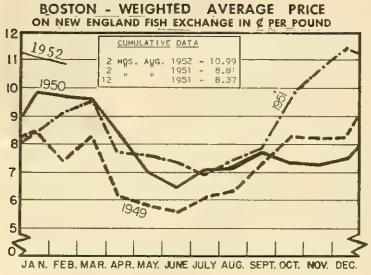
WASHINGTON - PUGET SOUND SALMON

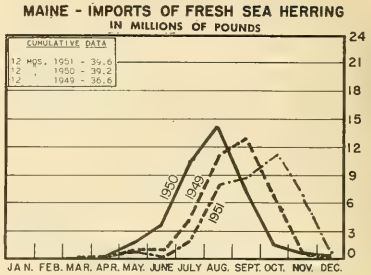


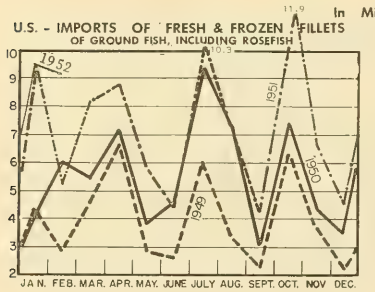
STANDARD CASES

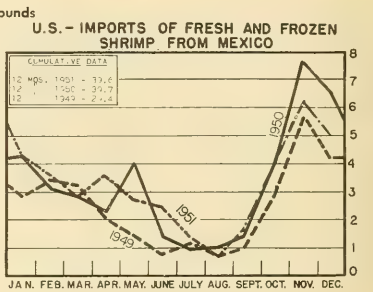
Variety	No. Cans	Can Designation	Net. Wgt.
SARDINES	100	1/4 drawn	3 1/4 oz.
SHRIMP	48	—	7 oz.
TUNA	48	No. 1/2 tuna	7 oz.
PILCHARDS	48	No. 1 oval	15 oz.
MACKEREL	48	No. 300	15 oz.
SALMON	48	1-pound tall	16 oz.

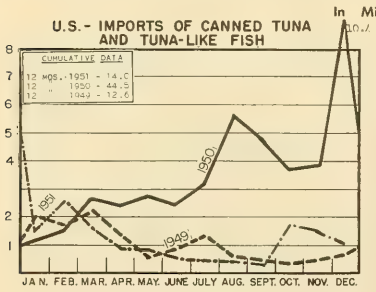
PRICES . IMPORTS and BY-PRODUCTS

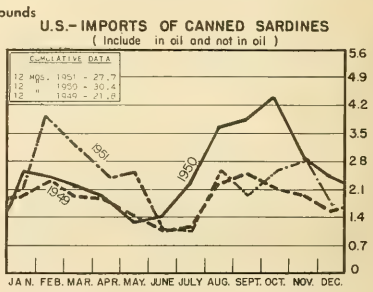


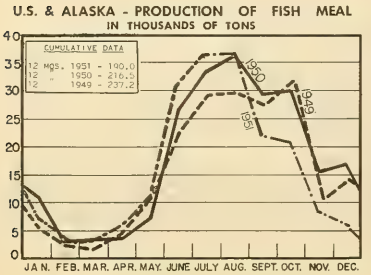


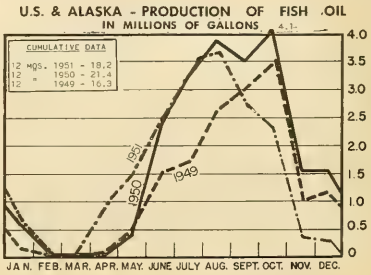


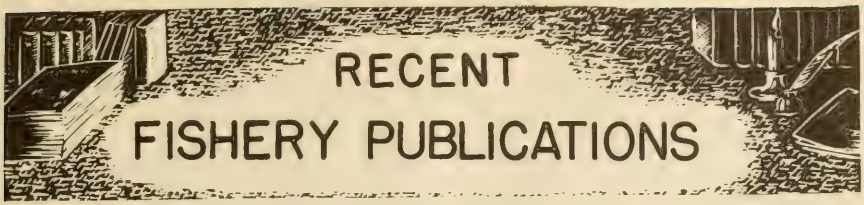












Recent publications of interest to the commercial fishing industry are listed below.

FISH AND WILDLIFE SERVICE PUBLICATIONS

THESE PROCESSED PUBLICATIONS ARE AVAILABLE FREE FROM THE DIVISION OF INFORMATION, U. S. FISH AND WILDLIFE SERVICE, WASHINGTON 25, D. C. TYPES OF PUBLICATIONS ARE DESIGNATED AS FOLLOWS:

CFS - CURRENT FISHERY STATISTICS OF THE UNITED STATES AND ALASKA.
FL - FISHERY LEAFLETS
SL - STATISTICAL SECTION LISTS OF DEALERS IN AND PRODUCERS OF FISHERY PRODUCTS AND BYPRODUCTS.
SEP.- SEPARATES (REPRINTS) FROM COMMERCIAL FISHERIES REVIEW

Number Title

CFS-703 - Fisheries of the United States and Alaska, 1949 Annual Summary, 12 p.
CFS-706 - Texas Landings, October 1951, 4 p.
CFS-713 - Frozen Fish Report, December 1951, 10 p.
CFS-722 - Frozen Fish Report, January 1952, 10 p.
FL-336k - Quarterly Outlook for Marketing Fishery Products, January-March 1952, 30 p.

Wholesale Dealers in Fishery Products (Revised):
SL-2 - New Hampshire, 1951, 1 p.
SL-4 - Rhode Island, 1951, 2 p.
SL-10 - Maryland, 1951, 10 p.
SL-12 - Virginia, 1951, 11 p.

Number Title

Whlsle Dlrs. in Fish. Prdts. (Rev.) (Cont.):
SL-14 - South Carolina, 1951, 2 p.
SL-15 - Georgia, 1951, 2 p.
SL-17 - Alabama, 1951, 3 p.
SL-20 - Texas, 1951, 4 p.
SL-21 - California, 1951, 10 p.
SL-24 - Minnesota (Lakes Area), 1950, 1 p.
SL-25 - Wisconsin (Lakes Area), 1950, 2 p.
SL-28 - Michigan, 1950, 3 p.

Sep. 304 - The Northern Shrimp Fishery of Maine.
Sep. 305 - Technical Note No. 16 - A Simple Penetrometer for the Measurement of Texture Changes in Canned Salmon.

THE FOLLOWING SERVICE PUBLICATION IS FOR SALE AND IS AVAILABLE ONLY FROM THE SUPERINTENDENT OF DOCUMENTS, WASHINGTON 25, D. C.

Estimation of Age and Growth of Yellowfin Tuna (NEOTHUNNUS MACROPTERUS) in Hawaiian Waters by Size Frequencies, by Harvey L. Moore, Fishery Bulletin 65 (From Fishery Bulletin of the Fish and Wildlife Service, vol. 52), 17 p., illus., printed, 15 cents, 1951. The growth rate of the yellowfin tuna is estimated from an analysis of original data and the estimates are compared with others in the literature. All evidence points to a very rapid growth of as much as 60 pounds a year.

MISCELLANEOUS PUBLICATIONS

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE AGENCIES ISSUING THEM. CORRESPONDENCE REGARDING PUBLICATIONS THAT FOLLOW SHOULD BE ADDRESSED TO THE RESPECTIVE AGENCIES OR PUBLISHERS MENTIONED. DATA ON PRICES, IF READILY AVAILABLE, ARE SHOWN.

Bulletin of the Fisheries Society of the Philippines, Commemorative Issue, vol. 1, 104 p., illus., printed, English, ₱2.00 (US$1.00) Fisheries Society of the Philippines, Manila, Philippines, 1950. This Society was inaugurated in June 1950 to stimulate and encourage research and to promote collaborative research in fisheries, and coordinate these with the economic needs of the nation; to cooperate with the government of the Philippines in the execution of

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fishery laws and in the formulation of policies dealing with the conservation and development of fisheries; and to gather and disseminate technical and other information pertaining to fisheries. Among the articles included in the first bulletin of the newly-organized Society are: A Survey of Fisheries Educational Institutions; The Future of the Trawling Industry in the Philippines; Management of Some Philippine Fisheries; Availability of Calcium in Bagoong (Salted Fish Paste) and Dilis (dried anchovies); Anatomical Evidence in Cases of Fish Killed by Explosives; and New Methods of Fish Capture in the Philippines.

Bulletin of the International Institute of Refrigeration, pp. 457-594, vol. XXXI, no. IV, printed. Institut International du Froid, Paris, France, 1951. Included are brief abstracts on the following subjects: biology and chemistry of food products and sanitation; refrigerating machines and equipment, refrigerated installations and experimental methods; low temperature application; and refrigerated transport.

Canadian Fish Recipes, Consumer Bulletin No. 3, 64 p., illus., printed. Department of Fisheries of Canada, Ottawa, Canada, 1951. This booklet deals with the preparation and cooking of fish and shellfish. The subjects covered include instructions in buying fish, storing fish in the home, preparing whole fish for cooking, general rules for cooking fish, home preparation of fish for freezing, home canning of fish, and recipes for main dishes, smoked, pickled and salted fish, shellfish, soups and chowders, salads, sauces, appetizers and sandwich spreads.

Central Fisheries Station of Japan Contributions 1948-49, Contribution Nos. 113-171, 336 p., illus., printed, Japanese and English. Tokaiku Suisan Kenkyujo, Tsukishima, Kyobashi, Tokyo, Japan, 1951. Reports on the following subjects are included: Injuring Mechanisms of the Oyster Drill (Purpuvs clavigera) to Young Oyster (Ostrea gigas); Green Discoloration of Frozen Swordfish (Xiphias gladius); Effect of Sodium Nitrite in Preserving Fish; DDT as a Net Preservative; Strength of the Japanese Agar-Agar Gel; Fish Insulin; Sodium Phosphate Crystals Found in Mild-Cured Salmon; Preservation of Marine Products by Chemicals (Chlorine Compounds); Struvite Found in Some Fisheries Products; A Rapid Determination of Sodium Chloride in Fisheries Products; Morphometry and Rate of Growth in Clam (Matra sulcatarla) in Tokyo Bay; Ecology of a Common Shore Shrimp; and Bad Taste of Amino-Acids Mixture (Elimination of Bad Taste).

(Ceylon) Administration Report of the Acting Director of Fisheries for the Years 1940 to 1950 (Part I--1940 to 1947), by E. R. A. de Zylva, 20 p., printed, 50 cents postpaid. Government Publications Bureau, Colombo, Ceylon, October 1951. Reports on the following subjects are included: the Fisheries Ordinance; Fisheries Advisory Board; dynamiting and poisoning of fish; indebtedness of fishermen; cooperative fishing societies; loans to the fishing industry; fisheries welfare stores; trawler fishing; fish marketing; and fisheries research.

Report on a Survey of the Inland Fisheries of Ceylon, by W. H. Schuster, Sessional Paper XXIV-1951, 15 p., map, printed, 50 cents postpaid. Government Publications Bureau, Colombo, Ceylon, October 1951. Reports on the results of an investigation made to estimate the potentialities of the brackish-water and fresh-water fisheries of Ceylon. The author's recommendations for the development of these fisheries are included.

Condition and Future of Dodecanesian Sponge-Fishery, by Nic S. Pizanias, 42 p., printed, Greek and English. Central Dodecanesian Committee, Athens, Greece, 1946. Every effort is being made to rehabilitate the sponge fishery, the second most important means of livelihood in the Dodecanese Islands. This report describes the present condition and the future of the Dodecanesian sponge fishery, the importance of the fishery for the Dodecanese, the deficiencies of the economic organization of the sponge fishery enterprise, and discusses means of eliminating these deficiencies.

"The Fisheries of Canada--A Valuable Asset," article, Foreign Trade, vol. 11, no. 262 (January 5, 1952), pp. 2-7, printed, single copy 10 cents. Foreign Trade Service, Department of Trade and Commerce, Ottawa, Canada. In this article is presented a resume of the fisheries of Canada. Among the subjects discussed are the early fisheries, the Canadian fishing grounds, the Atlantic and Pacific coast fisheries, fresh-water fishing, and export trade in fishery products.

Freshwater Fish as an Ingredient of Mink Rations, by J. M. Bell and Charles Thompson, Bulletin No. 92, 20 p., printed. Fisheries Research Board of Canada, Minister of Fisheries, Ottawa, Canada, 1951. A survey of 160 mink ranches in western Canada shows that a majority use freshwater fish in feeding mink. Tullibee (Leucichthys tullibee) and jackfish or pike (Esox eucius) are the fish most frequently used. Scraps of pickerel (Stizostedion vitreum) and whitefish (Coregonus clupeaformis) are used when obtainable. Ling or burbot (Lota lota maculosa) and suckers (Catostomus) are fed by some ranchers. "It would appear therefore that inland fish performed satisfactorily in mink rations (a) when care was taken to destroy the thiaminase by cooking those species containing it, or to feed additional thiamin-rich supplements, (b) when storage conditions for frozen fish were satisfactory, and (c) when recommended levels of 'protective foods' were included in the rations," state the authors in their summary. Of the ranches surveyed, only two regularly fed ocean fish or products.

(Illinois) Commercial Fisheries of Illinois Rivers: A Statistical Report for 1950, William C.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE AGENCIES ISSUING THEM.

Starrett and Sam A. Parr, Biological Notes No. 29, 35 p., illus., tables, printed. Natural History Survey Division, Department of Registration and Education, Urbana, Illinois, November 1951. The Illinois commercial fishing industry provided full-time employment for 253 fishermen and part-time work for 442 in 1950. The fish catch amounted to 8,954,015 pounds and was valued at $682,260. Included in this report are statistics on pounds and value of fish taken from Illinois rivers and the Mississippi River by Illinois commercial fishermen, tabulated by species and by types of gear; and estimated value of fishing devices and equipment. Data by Mississippi navigation pools are also given.

The Indian Dip Net Fishery at Celilo Falls on the Columbia River, by R. W. Schoning, T. R. Merrell, Jr., and D. R. Johnson, Contribution No. 17, 43 p., illus., printed. Oregon Fish Commission, Portland, Oregon, November 1951. This is the first of a series of reports of cooperative studies by the Washington Department of Fisheries and the Oregon Fish Commission. This report discusses the customs of the Indian dip-net fishery at Celilo Falls; geography of the grounds; fishing equipment; analyses of the closed-season catch and the commercial catch; disposition of fish during closed season; conditions affecting the fishery; and evaluation of the Indian catch.

Marine Industries of Eastern Arabia, by Richard LeBaron Bowen, Jr., 17 p., illus., printed, English. (Reprinted from the Geographical Review, July 1951). This report deals with the various methods of fishing utilized in Eastern Arabia--from a simple hand line to large and complicated fish weirs. It also includes a description of the pearl fisheries of the Persian Gulf.

(Colony of Mauritius) Annual Report on the Fisheries Branch for the Year 1950, No. 15 of 1951, by J. de B. Baissac, 14 p., printed, 25 cents. J. Eliel Felix, Government Printer, Port Louis, Mauritius, April 1951. Reviews briefly the commercial fisheries in the Colony of Mauritius. Statistics are given on the annual production of fishery products for each district, the average monthly catch by gear, and the monthly production for 1946-50.

Mid-Century Alaska, 166 p., illus., with map, printed, 75 cents. Office of Territories, U. S. Department of the Interior, Washington, D. C., 1951. (For sale by Superintendent of Documents, Washington 25, D. C.). This booklet serves as a source of reference to aid the student, the prospective settler, and the potential investor. In addition to general information about Alaska and its industries, it describes the commercial fisheries of Alaska and discusses employment opportunities in the fishing industry.

(Oregon) Fisheries Statistics of Oregon, Contribution No. 16, 176 p., illus., printed. Oregon Fish Commission, Portland, Oregon, September 1951. This statistical bulletin provides a ready source of information concerning the productivity of the marine and river commercial fisheries of the State of Oregon for recent years. With the exception of the river fisheries, only the statistics from 1928 to 1949 are presented. For the Columbia River fisheries, the records are fairly complete and data for earlier years are given. The coastal rivers are covered from 1923 to 1949, and the troll fishery data begin with 1925. A list of the names of commercial fishes is included in this report, together with a description of each fishery.

The Oyster Industry of Willapa Bay, Washington, by Trevor Kincaid, 45 p., illus., printed, $1.00. Calliostoma Co., 1904 East 52nd St., Seattle, Wash., 1951. An account of the oyster industry in brief non-technical language. This report discusses extent of the industry, kinds of oysters utilized, ownership of oyster lands, tidal conditions, history of the industry, methods employed to maintain supply of oysters, planting of oyster seed, cultivation of beds, harvesting oysters, unloading oysters at plants, preparation of oysters for market, oysters as food, pearls in oysters, enemies of the oyster, uses for oyster shell, and the oyster laboratory of the State Department of Fisheries.

The Pribilof Report, 1949, 83 p., illus., printed. U. S. Department of the Interior (Bureau of Indian Affairs and Fish and Wildlife Service), Washington 25, D. C., 1951. This publication covers the results of a factual study of the living conditions and human problems of the natives in the Pribilof Islands and various other native communities in the Bering Sea area. Because of the close relationship of the natives to the management of the highly valuable fur-seal resource, they enjoy an economic security on a par with the highest income group of any native people in all Alaska, states the report. The school systems now compare favorably with those in the best native communities in Alaska, and the hospitals and medical facilities are adequate. Other findings and recommendations of the survey group are included in this report.

Purse Seines to Lobster Pots, by F. H. Wooding, 19 p., illus., printed. Department of Fisheries of Canada, Ottawa, Canada, 1952. (Reprinted from Canadian Geographical Journal). This booklet describes the principal methods of catching fish in Canada's commercial fisheries. Included are descriptions of catching fish with bait, snaring fish with nets, and capture by direct attack. Short descriptions of the main types of fishing gear, together with illustrations, are included.

(Rhode Island) Division of Fish and Game (1950 Report), by Edward C. Hayes, Jr., Supplement, 18 p., printed. Department of Agriculture and Conservation, Providence, Rhode Island, 1951. This publication includes, among other data, a

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE AGENCIES ISSUING THEM.

report on the number of commercial fisheries licenses issued for each fiscal year 1945-46 through 1949-50; the lobster catch for 1950; number of lobster licenses issued and revenue received; and the lobster catch by months.

(Scotland) Herring Industry Board Sixteenth Annual Report for the Year Ended March 31st, 1951, 36 p., printed, 1s 3d (about 20 U. S. cents). His Majesty's Stationery Office, London, England, 1951. This is a report of Scotland's herring fisheries, with data on marketing, research and development, and the herring fleet. Included are statistics on the volume and value of catches in principal ports, cured herring production, composition and disposition of the fleet operating in East Anglia, and the utilization of herring. A description of the economic status of the herring industry and a financial statement of the Herring Industry Board for the year ending March 31, 1951, are also included. The economic state and the present state of the catching section of the herring industry, catching costs, production and consumption trends for 1946-50, the decline of the home market, and production and usage are discussed in an appendix to this report. Certain proposals for the redevelopment of the industry and the exploration of new fields of distribution are presented.

Studies on the Structure of the Fish School, by C. M. Breder, Jr., 27 p., illus., printed, 50¢. Bulletin of the American Museum of Natural History, vol. 98, article 1, November 19, 1951. This paper is concerned with the schooling behavior of one species of fish (Jenkinsia lamprotaenia), and the various influences that bear both on the form a school will take and the location in which it will appear. Observations are made on the effect of light and darkness, approach to backgrounds, formation of a mill, spacing and size of individuals, and effects of weather, isolation, temperature and depth of water.

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Branch of Commercial Fisheries, U. S. Fish and Wildlife Service
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Washington, D. C.

Name	Title	Room Number	Telephone	Teletype
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* * * * * * *

Field Offices

Location	Address	In Charge (Fishery Marketing Specialist)	Telephone	Teletype
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Editorial Assistant--Ruth V. Keefe Illustrator--Gustaf T. Sundstrom

Compositors--Jean Zalevsky, Dorothy Stein, Betty Coakley

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COMMERCIAL FISHERIES REVIEW MAILING LIST BEING CIRCULAR

Since Federal regulations require that all mailing lists be circulari[illegible], a circularization letter dated January 15 was sent to all those on the Commercial Fisheries Review mailing list. (Individuals or firms who have been added to the mailing list subsequent to October 1, 1951, will not receive a circularization letter and will continue to be retained on the mailing list, unless the recipient meanwhile requests that his name be removed.)

The names of those firms and individuals who do not return the lower portion of the January 15 circularization letter will be deleted from the Commercial Fisheries Review mailing list. The February 1952 issue will be the last one to be mailed to those who do not reply. A prompt reply to the circularization letter will assure your not missing any issues of the Review.

The circularization notice contains several questions which are to be answered by the recipients of the Review. The editors respectfully urge you to answer these questions as the answers will aid the editorial staff to determine the type of material that should be published in the Review in order to better serve the needs and interests of our readers.

Robert H. Gibbs, Jr.,
Dept. of Zoology
Stimson Hall
Cornell University
Ithaca, N. Y.
128 D

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